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JANUARY

# THE JOURNAL
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# AMERICAN DENTAL ASSOCIATION
AND
# THE DENTAL COSMOS

1937


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Cavity Preparation—*Morgan*
Denture Prosthesis—*Smedley*
Paradental Treatment—*Blanquie*
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**L. PIERCE ANTHONY, D.D.S.**
**Associate Editor of The Journal of the American Dental Association and The Dental Cosmos**

THE JOURNAL *of the*
AMERICAN DENTAL ASSOCIATION
*and* THE DENTAL COSMOS

Vol. 24 JANUARY, 1937 No. 1

## *Original Communications*

# SOME FAMOUS AND LESS FAMOUS DENTAL TRUANTS (AN ACCOUNT OF AMERICAN DENTISTS WHO HAVE ACHIEVED DISTINCTION IN OTHER FIELDS)*

By RALPH R. BYRNES, D.D.S., F.A.C.D., Atlanta, Ga.

IN a book called "Truants," recently issued by the Cambridge University Press, England, Lord Moynihan comments on those members of the medical profession who have achieved distinction in fields foreign to medicine. Among these, one hundred or more writers, artists, scientists, statesmen, explorers and even athletes are found.

Who would have thought that the impetuous Clemenceau could have practiced medicine at any time; that Sir Francis Seymour Haden, so well known in the art world, had a large and important medical practice, holding the thermometer and the paint brush with equal dexterity; that Arthur Conan Doyle, at one time a physician, could have created his incredibly original "Sherlock Holmes" tales; that William Gilbert, an English physician of the sixteenth century, would have given the word "electricity" to the English language; that the great Galvani, of electrical engineering fame, that Linnaeus, father of modern scientific botany, that Galileo and Robert Boyle all held medical degrees? American physicians, too, have achieved prominence in literature. It is well known that Oliver Wendell Holmes was almost as famous in medicine as in writing. It is less generally known that Dr. S. Wier Mitchell, originator of the "rest cure" for nervous afflictions, was equally famous as a novelist-poet.

On reading a review of Lord Moynihan's book, my thoughts turned to our profession of dentistry. How many dentists have achieved distinction in other fields? Library research revealed that dentistry parallels medicine—that many famous men have practiced dentistry during the whole or a part of their professional careers and achieved, at the same time, distinction in fields utterly foreign to dentistry. It further reveals the need of a paper or article giving a comprehen-

*Read before the Richmond (Va.) Dental Society, Sept. 17, 1936.

sive grouping of these "dental truants" and an account of their individual accomplishments, in order that the task of any future writers on the subject may be made a bit easier. There should be a place for a book about dentists similar to Moynihan's work regarding the medical profession, but this I leave to more ambitious souls.

In this brief paper, I shall deal only with American dentists. It is obvious that the inclusion of dentists of all nationalities would entail a tremendous labor, extending over a long period of time.

I shall mention only those dentists whose contributions are distinct from dentistry itself in all its branches and phases. For this reason, such notable figures as Chapin A. Harris, Horace Wells, W. T. G. Morton and G. V. Black are excluded. Pioneers in dental education, dental research and subjects correlated with dental practice or benefiting dental practice, I have considered as belonging strictly to the classification of dentistry and therefore beyond the scope of this article. It is the purpose of this account to reveal, in classified order, the wanderers in the bypaths—those vagrants whose versatility and talent have won them places in such extraneous pursuits as art, literature, general science and statesmanship.

## Literature

### Thomas William Parsons, Poet

Perhaps it would be safe to say that not one dentist in a hundred knows that Thomas William Parsons, a brilliant contemporary of Longfellow and other noted New England writers, was a dentist by profession. A biographical sketch in the New Standard Encyclopedia (Funk and Wagnalls Company, publishers) gives his birth date as 1819 and his death as occurring in 1892. Dr. Parsons was the son of a physician. He studied medicine at Harvard, later specializing in dentistry. (It must be borne in mind that there were no dental colleges in the United States until 1840, when the Baltimore College of Dental Surgery was established. For that reason, all dentists who reached maturity previous to 1840 were necessarily compelled to acquire their dental education by apprenticeship with practicing dentists.)

Parsons enjoyed a large dental practice in Boston. At one time, he practiced in London, England. During the whole of his life, he was highly respected as a dentist and as a poet.

In 1836, when only 17 years of age, he went to Italy to make a study of the works of the great Italian poet, Dante. While there, he made a translation of the first ten stanzas of Dante's "Inferno," which he published, in part, on his return to Boston in 1843. It received favorable attention. He continued to work on his translation, and published a completed version in 1867. At the time of his death, in 1892, Parsons was working on a translation of the "Purgatorio" and the "Paradiso." He left these manuscripts uncompleted. He also wrote original poetry, a posthumous book entitled "Poems" appearing in 1893.

Parsons was a personal friend of Henry Wadsworth Longfellow, who used him for the model of the poet in the famous "Tales of the Wayside Inn." Thomas Bailey Aldrich, another contemporary and friend, gives this description of Parsons:

> During the last twenty-five or thirty years, a tall, slight figure, somewhat bent of late, with Dantean eyebrows overhanging eyes of a singular, penetrating sweetness when they looked at you, was a frequent figure on the streets of Boston. Here and there it encountered a friendly glance of recognition. The passersby were unconscious that that shy man with the inward-looking eyes was a poet of rare gifts, who,

however lacking in variousness, occasionally managed in his own direct, artisan way, to pierce as deep as any of his great contemporaries, excepting possibly Emerson. He was a man of great simplicity and alert sympathies; a charming companion when he was out of his cloud, and even when in his cloud, a most courteous dreamer. That he sometimes dropped his reserve with me, in his enthusiasm over some question of literature or art, is now among my cherished memories.[1]

SOLYMAN BROWN, A.M., D.D., M.D., D.D.S., POET

Solyman Brown was born in Litchfield, Conn., Nov. 17, 1790. He is best known for two of his minor poems, one called "Dentologia," a poem on the diseases of the teeth and their proper remedies; the other, entitled "Dental Hygeia," a poem on the health and preservation of the teeth. Naturally, because of their subject matter, these should be familiar to the dental profession. Though they were well written, considering the literary style of the day, it is nevertheless surprising that Dr. Brown's discrimination did not forbid his writing on such a prosaic theme. Poetry can never lend itself to utilitarian purposes. That is the function of prose.

Little attention has been given the more worthy aspects of Dr. Brown's literary career. For sixty-five years, he contributed to literary periodicals, many of his poems appearing in the *New York Mirror* and in William Cullen Bryant's *New York Evening Post*. He also published a book in New Haven, Conn., which contained, among other things, "An Essay on American Poetry." He was a man of deep culture and refinement, and, though a lesser literary figure than Parsons, he deserves to be remembered. Apparently, all his poems were never collected in book form. Here is an opportunity for some dentist who wishes to preserve the traditions of dentistry and at the same time perform a possible service for literature.[1]

ELEAZAR PARMLY, M.D., D.D.S., POET

Eleazar Parmly was born in Braintree, Vt., March 13, 1797. In addition to being a distinguished dentist, he was a lover of the arts and a writer of poetry, publishing at the age of 71 a volume of 800 pages. This book of original poems, entitled "Thoughts in Rhyme," was dedicated to his children.

Coming from a distinguished family of professional men, Dr. Parmly was the personal friend of many of his eminent contemporaries. He was an intimate friend of President Abraham Lincoln, who entertained him at the White House. Numbered among his other close friends were Horace Greeley and Thomas Buchanan Reed, the well-known poet. Here, too, is a fertile field for some collector who wishes to preserve the nontechnical literature of the profession. As far as I know, there is no volume of Eleazar Parmly's poetry available in libraries.

Dr. Parmly also was a successful financier. On his wife's death, he inherited three lots on Broadway and Maiden Lane, New York City, and, on his own death, he left a fortune of $3,000,000, acquired through real estate investments.[1]

EDWIN JAMES DUNNING, D.D.S., POET, ESSAYIST, CRITIC

Edwin James Dunning, born July 19, 1821, in Camillus, N. Y., became blind at the age of 53. A man's affliction sometimes becomes a world benefaction. On losing his sight, Dr. Dunning became intensely interested in the works of Shakespeare. He memorized every one of

1. Thorpe, B. L.: History of Dental Surgery, Vol. III, Chicago: National Art Publishing Company, 1909.

Shakespeare's 154 sonnets. He studied these sonnets by night and day, turning them over continually in his mind. Out of this intense concentration came his book, "The Genesis of Shakespeare's Art," which was published by Lee and Shepard, of Boston, in 1897. While the book has not had a gratifying popular sale, it is, nevertheless, highly prized by Shakespearean scholars and fills a much needed place in reference libraries.[1]

ANDERSON M. SCRUGGS, D.D.S., F.A.C.D., POET

Anderson M. Scruggs, a contemporary dentist, has achieved wide recognition in the field of poetry. He was born Feb. 18, 1897, in West Point, Ga., and lives in Atlanta at the present time. He is a grandson of the late William Lindsay Scruggs, formerly United States Minister to Venezuela and Colombia.

He began writing poetry in 1928, shortly after his graduation from dental college. In the brief period of eight years, he has reached the front ranks of American poetry, as mention of his achievements will attest. He is a contributor to such nationally known magazines as *Harper's, The Forum* and *Century, The North American Review* and the *Saturday Evening Post,* and his poems frequently have been reprinted in the *Literary Digest.*

Dr. Scruggs has been included in so many reputable anthologies that a great deal of his poetry is already assured of preservation. For six consecutive years—1930 to 1935, inclusive—his poems have been included in Thomas Moult's yearly anthologies of "Best Poems" of America and Great Britain. Mr. Moult is a London anthologist, and his annual collections are looked forward to with keen interest, being published each year simultaneously in America and England.

Dr. Scruggs' verse has appeared in many other representative anthologies of poetry issued by leading American publishers. At least two college textbooks of English, one called "Poetry, Prose and Drama for Oral Interpretation," and another, "Western Prose and Poetry," issued by Harper and Brothers, include poems by him.

His first book of poems, "Glory of Earth," published by the Oglethorpe University Press in 1933, contains seventy-six of his poems. His best-known poem, "Glory to Them," has been referred to by a number of discriminating critics as one of the greatest American sonnets. It even has attained the dignity of being included in the reading services of a current hymn book. If this comparatively new writer continues to make progress at the present rate, dentistry may confidently hope that he will become the Oliver Wendell Holmes of the profession.[2]

MAURICE WILLIAM, D.D.S., WRITER ON ECONOMICS

Maurice William, who practices dentistry in New York City, is the author of a book, "The Social Interpretation of History," which has received the hearty commendation of men like the late Dr. David Starr Jordan, president of Leland Stanford University, and Dr. Sun Yat Sen, leader of the successful Chinese revolution. The book has an introduction by Dr. Oswald Spengler, and was translated into German in 1924. First privately printed, it attracted little attention until it appeared publicly in 1921.

Sun Yat Sen, toward the end of his career, was so impressed with the book that he adapted its principles in shaping the policies of the national government. He wrote a book based on Dr. William's views. This is conclusively shown in

2. Byrnes, R. R.: Dr. A. M. Scruggs Gains Recognition in the Field of Dental Literature, D. Survey, 6:35 (Oct.) 1930.

William J. Gies' article regarding William's book, in which Dr. Gies quotes considerable parallel reading matter from both works. The content of these two books is remarkably similar. Thus, it will be seen that the avocation of a dentist has influenced the course of a great nation.[3]

ZANE GREY, D.D.S., NOVELIST

The works of Zane Grey are so well known that any comment here is superfluous. He is probably one of the most popular and highly paid novelists of all time.

Zane Grey was born in Zanesville, Ohio, Jan. 31, 1875. He graduated from the dental school of the University of Pennsylvania, and, according to his biographers, had some difficulty in making his living at dentistry. It has been revealed that he studied dentistry to please his father and that he never had a real desire to become a practitioner. His first novel, "Betty Zane," written around the character of a sister of his great grandfather, was first privately printed, through the financial assistance of one of Dr. Grey's patients, since Grey was unable to find a publisher willing to undertake the risk of its publication. The book was a success, and the publishers who turned down Zane Grey's first novel now consider themselves fortunate to get the chance of considering anything he may write.

Grey also has written books of nonfiction dealing with the art of fishing. He is lost forever to dentistry, but his novels are assured of a tremendous popular sale for many years to come.[4]

3. Gies, W. J.: Living American Dentist's Epochal Intellectual Contribution to World History, J.A.D.A., 18:981 (June) 1931.

4. Herzberg, M. J.: Zane Grey—From Dentist to Best-Seller, Oral Hyg., 17:1736 (Sept.) 1927.

ROBERT ROLLINS ANDREWS, A.M., D.D.S., F.R.M.S., PLAYWRIGHT-POET

Robert Rollins Andrews was born in Boston, Mass., Aug. 7, 1844. He was best known as a playwright, having written, among other things, a comedietta in 1870 called "Silverstone's Wager," which was played at Lingard's New Adelphi Theatre, Boston, and also at Selwyn's Theatre in that city. From time to time, he contributed poems to the *Boston Transcript*.[1]

LEHMAN WENDELL, D.D.S., ESPERANTIST

The contribution of Lehman Wendell is unusual. He is considered an American authority on the new, universal language, Esperanto. Dr. Wendell, whose home is in Minneapolis, has taught this subject at evening classes at the University of Minnesota and has conducted classes by correspondence under the auspices of the University. He has translated several books into Esperanto and has written three original books on the subject.[5]

R. OTTOLENGUI, M.D.S., D.D.S., LL.D., F.A.C.D., AUTHOR AND ENTOMOLOGIST

Rodrigues Ottolengui, of New York City, has written many short stories and books, including "The Crime of the Century," "The Conflict of Evidence," "A Modern Wizard" and "An Artist in Crime." The last named has been translated into both German and French.

Dr. Ottolengui also is an entomologist. His fine collection of butterflies and moths has attracted wide attention.

Time will not permit more than mere mention of other American dentists who have contributed to the field of literature. These include the late Charles Channing Allen, of Kansas City, writer of essays and poems; Samuel Grief, of Brooklyn,

5. Wendell, Lehman, Esperantist, D. Survey, 7:49 (Feb.) 1931.

N. Y., author of "Who's Who in Dentistry" and a book of short stories published in 1922; George Wood Clapp, of New York City, biographer; C. N. Johnson, the Editor of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, who, besides being an essayist, is the author of novels, poems and short stories published early in his career; Edward Cook Mills, of Columbus, Ohio, librarian of the dental division of the municipal library of that city, and Charles W. Mills, of Chillicothe, Ohio, both of whom are bibliophiles and bibliographers; Arthur G. Smith, of Peoria, Ill., author of poems and sketches, and Bernard W. Weinberger, of New York City, historian, librarian and bibliophile. It also is fitting that mention should be made here of two well-known Richmond dentists, the late J. A. C. Hoggan, poet and marine landscape painter, and John Bell Williams, essayist.

## ART

### NORMAN W. KINGSLEY, M.D.S., D.D.S., SCULPTOR AND PAINTER

Norman K. Kingsley, one of the greatest figures that dentistry has contributed to the world of art, was born Oct. 26, 1829, at Stockhold, N. Y., and was, in addition to being a most distinguished dentist, a highly cultured and scholarly gentleman. He spent much time in Italy, where he enjoyed the friendship of artists and the atmosphere of old world culture.

He was a sculptor and a painter, and while he was highly successful in both arts, he reached his highest pinnacle in sculpture. His "Bust of Christ," which he modeled in 1868, is a magnificent piece of work, and, as would be expected, it has been very highly commended by discriminating critics. It has been said that Dr. Kingsley succeeded in portraying The Master without neglecting His manliness, a fault which mars Thorwaldsen's conception of The Christ. In Kingsley's bust, manliness and gentleness complement each other, and the beauty of the face is not accentuated at the expense of character. The face of Kingsley's Christ shows the noblest lineaments of the Greek, Roman and Jewish races, sublimated and combined with amazing skill. His bust of Christ, reproduced in marble, stands today in the Evans Museum at Philadelphia.

A direct quotation from Kingsley regarding his conception and execution of this inspired piece of work should be interesting:

> While spending a portion of a winter in Florence, Italy, I was a frequent visitor to the studio of our noted countryman, Hiram Powers, who made me welcome and invited me to be present when he was modeling. He had just completed in clay the model of a bust of Christ, and asked my opinion of it. I do not suppose that he considered that my opinion was of any importance, but he asked me more as a courtesy than otherwise, and courtesy, likewise, required a complimentary answer. I could not tell him the real impression that the figure made upon me, which, considering the lofty character of the subject, was decidedly unfavorable. In no sense, whatever, did it measure up to my idea of the character; it was distinctly commonplace, banal; there was not a suggestion of spirituality in the face, or nobility in the figure. I was much disappointed that an artist of Powers' worldwide celebrity should have so low a conception of this wonderful personage.

Kingsley states that he brooded much over the statue, that he longed day and night to create a Christ embodying his conceptions of beauty and nobility. He speaks of working on his model after office hours in a studio which he constructed for the purpose. Here he spent many a perplexing, though pleasant, and long winter evening struggling to embody his ideal in the bust of The Master.

When it was finally completed, it fell one night to the floor and was ruined. With the tenacity characteristic of the true artist, Dr. Kingsley began all over again, finally completing the bust after constantly working on it through the winter months into spring. In speaking of his "Christ," Kingsley says:

I gave him the head of a Caucasian because I believed that the most pleasing and that it will be the dominant type of a homogeneous race. I gave him the features of a woman, because I saw in women the best expression of heavenly attributes—mercy, loving-kindness, gentleness and purity. I gave him the face of an angel, and, lastly, I gave him a brain development along recognized phrenological lines which would be within the possibilities of human existence. I gave him the soft beard of a man of thirty, the uncut hair of the Nazarene, and the conventional drapery of his locality and time.

But, like the true artist, Dr. Kingsley says, in conclusion: "It was afterwards reproduced in marble, and the result is before the world, but it has never filled my ideal."[1]

SHEARJASHUB SPOONER, M.D., ENGRAVER AND LEXICOGRAPHER

Although Shearjashub Spooner possessed only the medical degree, he was a dental practitioner. He was born Dec. 3, 1809, at Orwell, Vt., thirty-one years before the establishment of the first dental college in America. He began the practice of dentistry immediately after his graduation in medicine in 1835.

He is best known in the world of art for the restoration of the famous work, "Illustrations of Shakespeare," by the Englishman Boydell. After many English editions of this renowned work were published, the plates for the fine engravings became much worn. Dr. Spooner purchased the old plates, and, assisted by a large force of skilled American artists, he succeeded in completely restoring them. The American edition was printed in folio and the work was in great demand by librarians and art connoisseurs throughout the country. It was known as "The American Edition of Boydell's Illustrations of Shakespeare."

Dr. Spooner was a lexicographer of note also, editing and publishing a "Biographical and Critical Dictionary of Painters, Engravers, Sculptors and Architects," a volume of 1,200 pages; also another work entitled "Anecdotes of Painters, Engravers, Sculptors, Architects, and Curiosities of Art." Another important work of his was a magnificently engraved and embellished edition of "The New Testament."[1]

J. LEON WILLIAMS, D.D.S., L.D.S., ARTIST, WRITER

Because of his long residence in London, where he accomplished most of his great work for dentistry, many think of J. Leon Williams as being an Englishman. He was an American, born in Concord, Maine, April 21, 1852, and received his dental training in this country. His death occurred several years ago.

Though in dentistry he is one of the giants, comparatively little is known of his highly successful efforts in both art and literature. He achieved considerable success in painting. About a year after he began painting, he sold a small picture to an American collector for $1,000. Putnam and Sons, prominent publishers, issued a special holiday edition of Irving's "Legend of Sleepy Hollow," in which photographs by Dr. Williams were used as illustrations. Charles Scribner and Sons published his "The Home and Haunts of Shakespeare" in 1892. The remarkable versatility of Dr. Williams approached true genius.[6]

6. Clapp, G. W.: Life and Work of J. Leon Williams, New York City: The Dental Digest Publishing Co., 1925.

Under the general heading of "Art," the mention of several contemporary names is in order: O. H. Simpson, of Dodge City, Kan., who is the author of a heroic statue commemorating "Old Settlers and Pioneer Day," erected in the public square of that city; Wilbur M. Dailey, of New York City, painter; S. K. Ash, of New York City, painter; J. R. Schwartz, of Brooklyn, painter and sculptor[7]; E. E. Munns, of Minneapolis, Minn., sculptor; Joseph H. Beuchler, of Pittsburgh, talented worker in "plaster bas-relief[8]; Milton Cohen, of New York City, sculptor; James V. Gentilly, of Cleveland, Ohio, sculptor; Simon Berlin, of New York City, painter[9]; Louis J. Gerber, of Brooklyn, N. Y., sculptor[10]; C. H. Goodrich, of St. Paul, Minn., painter; and Herbert W. Kuhn, archeologic collector, of Milwaukee, Wis.[11]

Since some may detect the omission of the famous painter Charles Willson Peale (1741-1827) in this paper, a word of explanation may be in order. While certain writers have given the famous portrait painter credit for being a dentist, rather exhaustive search fails to substantiate this claim, as his forays into the field of dentistry seem to have consisted only of an attempt to evolve a more satisfactory material out of which artificial teeth could be made, as a substitute for the bone dentures in use in his day. Peale's portraits of George Washington and others of his time are famous works of art, and I regret that I cannot authoritatively include him as a dentist in this paper. There are no records to show that he practiced dentistry at any time.

7. Dr. J. R. Schwartz, Painter and Sculptor, D. Survey, 7:51 (July) 1931.

8. Dr. Beuchler Adopts Art as His Hobby, D. Survey, 4:30 (Nov.) 1928.

9. Dr. Simon Berlin, a Versatile Artist, D. Survey, 5:42 (Nov.) 1929.

10. Dr. Gerber Emphasizes the Symbolic in Sculpture, D. Survey, 5:27 (Aug.) 1929.

11. Archeology Is Seven Dentists' Hobby, Oral Hyg., 19:32 (Jan.) 1929.

## General Science

### JOHN J. R. PATRICK, D.D.S., ARCHEOLOGIST AND ETHNOLOGIST

J. J. R. Patrick, born in Liverpool, England, Feb. 6, 1928, received an honorary D.D.S. degree from the Missouri Dental College. He has made important contributions to the sciences of archeology and ethnology, being chiefly known for his work of surveying the great Cahokia mounds in Illinois. He made models of these mounds for the Smithsonian Institute and similar museums in Europe. Many of his archeologic collections are the property of the Missouri Historical Society and bear his name as the "Patrick Collection."[1]

### THERON SYLVESTER HITCHCOCK, M.D.S., BOTANIST, ENTOMOLOGIST, WOOD CARVER

Theron Sylvester Hitchcock was born in Northampton, Mass., July 22, 1830.

On a trip to Arizona, he collected specimens of the flora of that state for the Smithsonian Museum. His entomologic collections consisted of centipedes, spiders, beetles, scorpions and tarantulas. He practiced dentistry in a number of foreign countries, and, while in Europe, he made a notable collection of old armor, guns, pistols, swords and powder horns. As if to counterbalance this tendency toward the accumulation of the destructive in insects and death-dealing instruments, he also collected pearls, opals and Greek and Roman cameos. Also, he was a wood carver, carving statuettes of Roscoe Conklin, John Greenwood, Thomas W. Evans and others.[1]

### HORACE H. HAYDEN, M.D., D.D.S., GEOLOGIST

Horace H. Hayden is so well known as one of the organizers of the first dental

college that his fame in dental education has overshadowed his work in geology. Hayden was born Oct. 13, 1769, in Windsor, Conn.

His collection of minerals became the foundation for a complete collection in Roanoke College, Virginia. To him goes the distinction of publishing, in 1821, the first general work on geology in the United States, a book of 400 pages. A new mineral which he discovered was named "Haydenite" in his honor. Dr. Hayden also was a botanist. In addition, he wrote articles on silkworm culture.[1]

### W. E. GOCHENOUR, D.D.S., ASTRONOMER

W. E. Gochenour, of Portage, Wis., a contemporary, has been following his avocation of astronomy for more than twenty years. He has designed and completed a machine called the "Tellurian," which demonstrates the earth, moon and sun in their relative positions. The "Tellurian" is designed as an aid in teaching.[12]

Among other contemporaries who have contributed to general science are: John Francis Drake, LL.B., D.M.D., who classified the flora for the World's Columbian Exposition at Chicago; Lester C. Ogg, D.D.S., who was assistant professor of military science at the Ohio State University from 1921 to 1925; and Harvey Stallard, Ph.D., D.D.S., who has held numerous teaching positions in botany and is the author of articles on that subject.

## Invention and Manufacture

Mahlon Loomis, D.D.S., and Edward Maynard, A.M., M.D., D.D.S., are two great figures whom dentistry has contributed to the field of invention.

### MAHLON LOOMIS

Mahlon Loomis was born in Oppenheim, N. Y., in 1826. He is mentioned in the Encyclopedia Britannica as one of the earlier experimenters with wireless telegraphy, antedating Marconi. Even though the Britannica speaks of his wireless device, along with other early projects, as being more or less impracticable, the very fact that he is mentioned as one of the pioneers in this important field is a distinct achievement.

Dr. Loomis made his first public demonstration of his "system of aerial telegraphy" in 1866. On each of two peaks of the Blue Ridge Mountains in Virginia, 18 miles apart, he sent up ordinary kites, each kite being connected to an insulated copper wire attached to a telegraph apparatus. The telegraph operators on each peak sent messages across to the opposite peak. These messages were received just as though the two kites had been connected by wire. Telescopes were provided the parties on each peak, in order to detect and verify the signals.

Dr. Loomis later succeeded in sending wireless messages between two boats stationed 2 miles apart on Chesapeake Bay. From 1869 to 1873, Loomis and his friends petitioned Congress for assistance in establishing wireless telegraphy in America, and, after many disappointments, they finally succeeded in persuading Congress to act. In 1873, it passed a bill incorporating the "Loomis Aerial Telegraph Company," which was signed by President Grant. Congress had overlooked the slight matter of providing the $50,000 appropriation asked for, and the project was stillborn. The hand of chance is often a potent factor in a man's fame. H. O. Bishop, in speaking of Loomis in an article in the *Dearborn Independent,* said: "Had it not been for the attitude of big newspapers and the stubbornness and lack of vision of Congress, this country today would be enjoying the honor of

12. This Dentist's Hobby Is Astronomy, Oral Hyg., 18:2315 (Dec.) 1928.

presenting wireless telegraphy to the world."[13]

EDWARD MAYNARD

Edward Maynard, dentist, born in Madison, N. Y., April 26, 1813, and who practiced dentistry in Washington, D. C., from 1836 to 1890, is perhaps dentistry's very greatest in the field of invention. He is known far and wide as the inventor of the breech-loading rifle, which he patented in 1851. This later became known as the "Maynard" rifle, and, five years after the patent was secured, it was adapted to the use of the metallic cartridge.

According to the New Standard Encyclopedia, Maynard's first important invention occurred in 1845, when he perfected a system of priming, which practically superseded the percussion cap. In 1860, he patented a method of converting muzzle-loaders into breech-loaders. Dr. Maynard invented many other improvements in firearms. Those who would like to read the remarkable story of his inventions in more detail should consult Volume III of Burton Lee Thorpe's "History of Dental Surgery."

Dr. Maynard was honored abroad for his work. He was complimented by the King of Belgium as the "author of a beautiful invention." He was made a chevalier of the military order of the Red Eagle by the King of Prussia, and the King of Sweden conferred on him the "Great Medal of Merit," an honor very rarely given a foreigner.

Here is a member of the dental profession of whom we all can be profoundly proud, one whose name is found in all important encyclopedias. Yet, notwithstanding his epochal achievements in other fields, he was a consistent and efficient practitioner of dentistry. He richly deserves the title of "genius."[1]

WILLIAM GIBSON ARLINGTON BONWILL, M.D., D.D.S., INVENTOR

W. G. A. Bonwill was born in Camden, Del., Oct. 4, 1833. Although he is exceedingly well known for the dental articulator that bears his name, very little is known of his important inventions in other fields. Among these may be mentioned the "Welsbach" burner for kerosene lamps, the shoe-fastener, the safety pin—surely all mothers should rise up and call him blessed!—and various improvements in grain reapers. At the time of his death, he was attempting to perfect an aerial car operated on the trolley principle.[1]

AMOS WESTCOTT, B.S., C.E., M.D., D.D.S., INVENTOR

Amos Westcott, born in Newport, N. Y., April 28, 1815, was a most versatile man. His most important extradental achievements were in the field of invention. He invented and patented a rotary churn which made butter in one minute, a door spring, an escutcheon to prevent keys being turned from the outside and a door bolt. Not satisfied with these achievements alone, he turned to politics, becoming Mayor of Syracuse, N. Y., in 1860. It also is most interesting to recall that Amos Westcott was the father of the author of "David Harum."

Among contemporary dentists who have contributed to invention and manufacture may be mentioned Alfred Wilkes, of Los Angeles, Calif., designer of a mooring mast for dirigibles[14]; William Lowell, of New Jersey, inventor and manufacturer of the "Reddy" golf tee[15];

13. Adair, R. B.: Contributions of Dentists Outside Their Profession, J.A.D.A., 13:1359 (Oct.) 1926.

14. Dr. Wilkes Invents Dirigible Mooring Device, D. Survey, 6:34 (Nov.) 1930.

15. A Dentist Designed the Wooden Golf Tee, Oral Hyg., 18:1304-11 (July) 1928.

T. B. Welch, manufacturer of Welch's Grape Juice; Howard Van Antwerp, inventor of the drag line scraper system for commercial excavating; and H. Monford Smith, inventor of the "Smith dimmer" for automobile lights.[1]

### Politics and Diplomacy

#### THOMAS W. EVANS, M.D., D.D.S., UNOFFICIAL DIPLOMAT

Thomas W. Evans is, of course, best known as a benefactor of dentistry through his generous endowments. There is a romantic side to Dr. Evans' life of which few people are aware. On her request, he aided Empress Eugenie in the hazardous undertaking of escaping to England during the riots following the fall of Sedan. A fascinating account of this is given in Thorpe's "History of Dental Surgery, Volume III."

Being a close friend of Napoleon III, Dr. Evans was sent by him to America to determine the possibility of the success of the Confederates in the war between the states. He sought the opinion of President Lincoln, at Washington, and on learning from him that the Southern cause was very likely to fail, he reported his findings to Napoleon. As a result of Dr. Evans' acting as ambassador without portfolio in this instance, France decided to remain neutral.[1]

#### HENRIK SHIPSTEAD, D.D.S., U. S. SENATOR

The only dentist, as far as I know, who has had the honor of being a United States Senator is Henrik Shipstead, who was born in Kandiyohi County, Minnesota, Jan. 8, 1881. He served in the Senate from 1923 to 1929. Among his published articles on governmental affairs are "Interest Rates and the Public Debt," "Government Interest Rates" and "Stock Inflation vs. Prosperity."[16]

I have knowledge of three dentists who have been members of the House of Representatives in Congress. They are: Frank Crowther, who was a member of the 66th, 67th and 68th Congresses, from New York; J. S. Wolff, of Missouri, who was a member of the 68th Congress, and R. O. Woodruff, of Michigan, who sat in the 63rd, 68th and 69th Congresses.

The eminent "medical truants" that Lord Moynihan included in his book of that name have distinguished and elevated the practice of medicine by their glorious excursions outside their profession. It is hoped that this short account of doctors of dental surgery who have wandered afield will stimulate dentists to an appreciation of the added prestige that they have brought to an already highly honored profession.

106 Forrest Avenue, N. E.

16. Grief, S. J.: Who's Who in Dentistry, Vol. II, Brooklyn: Who's Who Dental Publishing Co., 1925.

# CAVITY PREPARATION FOR THE DECIDUOUS TEETH*

By GEORGE E. MORGAN, D.D.S., Milwaukee, Wis.

PRACTICALLY every dentist knows from experience that little thought is devoted to the solution of the supposedly simple problems in dentistry and much study is given the more difficult tasks. Yet, many of the apparently simple conditions give us the most trouble, owing chiefly to our inability to analyze the situation. Cavity preparation in the deciduous teeth differs from cavity preparation in the permanent teeth mainly because of their anatomic characteristics. Most practitioners have been sincere in their attempts to fill the deciduous teeth, but, in spite of their earnestness, the fillings did not stand the forces of mastication and became loose, with recurrence of decay. Further periodic care was neglected, since the parent felt that the tooth had been properly restored to health and function. These dentists have done excellent work for their adult patients because they were taught cavity preparation as it applies to the permanent teeth; but when these same principles were applied to preparation of a cavity in the deciduous tooth, the procedure was incorrect and the restoration was a failure. Premature loss is sure to follow incorrect cavity preparation in the deciduous teeth.

Mistakes in cavity preparation in the deciduous teeth are due largely to (1) failure to manage the child patient, with the result that the cavity preparation is done in a slip-shod manner; (2) ignorance of the anatomic characteristics of the deciduous teeth as compared to those of the permanent teeth; (3) failure to visualize the relation between the cavity preparation and the finished restoration, and (4) inability to apply the modern concept of correct cavity preparation to the deciduous teeth.

Conservation of tooth structure of the deciduous teeth should always be uppermost in our minds, and while extension for prevention is important in the fissures, it is not so essential lingually and buccally in the deciduous teeth as in the permanent teeth. A cavity cannot be cut so deeply in the deciduous tooth as in the permanent tooth without endangering the pulp. Therefore, the cavity preparation should be broad in order to compensate and to give the strength necessary for the filling material.

One must be able to visualize the finished restoration before starting the cavity preparation, as there is a close relationship between cavity preparation and the filling material used to restore the tooth. The cavity preparation that I shall describe for compound cavities in the deciduous molars is for the silver amalgam filling, which is that most commonly used in the deciduous teeth. If one is able to prepare a cavity correctly in a deciduous tooth and manipulate silver amalgam as it should be handled, he will have no difficulty in preparing a cavity for the insertion of a silver or gold inlay, the only other two fillings that are suitable for the compound proximal restoration of the deciduous molars.

*Read before the Section on Children's Dentistry and Oral Hygiene at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

Psychologically, we should, whenever possible, begin cavity preparation on the lower left side, because the operating position with the left arm around the child's head affords better control of both the child and the instruments. This is very important until confidence has been established. The instruments used are essentially the same as for all cavity preparation, with the exception of the burs. The short shank bur is most adaptable in all cavity preparation for the child patient. Only sharp burs should be utilized, in order to reduce the amount of pain caused by friction. The speed of the engine should be slowed down to 1,600 or 1,800 revolutions a minute. Indiscriminate use of air to dry the cavity is very painful. A pellet of cotton should be used instead.

In viewing a roentgenographic section of the jaw of a child of normal development and 7 years of age, and practically applying the conditions present which have a direct bearing on cavity preparation, we cannot but realize that the pulp chambers as compared to those of the permanent teeth are larger and nearer the surface, the enamel is thinner and the crowns are more bell-shaped. (Fig. 1.) All of this must be kept in mind during cavity preparation of the deciduous teeth to prevent pulp exposure and yet obtain outline and retention form for the filling material.

The most difficult cavities to prepare

Fig. 1.—Normal dental development at 7 years of age; no proximal caries.

Fig. 2.—Caries in proximal surface of deciduous molars.

Fig. 3.—Distoclusal preparation of lower first deciduous molar; showing broad occlusal step.

Fig. 4.—Small mesial cavity on second deciduous molar.

are those occurring in the proximal surface of the deciduous molars. (Fig. 2.) In these areas, decay, after penetrating the enamel, because the dentin is softer and more permeable, progresses so rapidly that it may involve the pulp without breaking through to the occlusal surface and being recognized as a cavity by the parent or child. For this reason, it is important not only that these cavities be discovered early, but also that there be correct cavity preparation and proper filling of the cavity. This can be accomplished by the following procedure: The cavity in the distal surface of the first deciduous molar is prepared as a distoclusal cavity by (1) breaking down of the distal wall with a small sharp chisel; (2) removal of the food débris with a spoon excavator; and (3) removal of the decay by a No. 6 short shank round bur. This is followed by the use of a No. 558 short shank fissure bur to square the walls of the cavity. No proximal cavities that involve the occlusal surface should be prepared without an occlusal step, which serves as a means of retention for the filling. Beginning in the occlusal surface, with a small short shank inverted cone bur, the operator cuts only through the enamel, following with a No. 558 short shank fissure bur, which is moved distally to reduce the amount of pain and to prevent exposure of the horn of the pulp. The occlusal step should be made broad

Fig. 5.—Cavity in mesial aspect of second deciduous molar prepared as simple proximal cavity.

Fig. 6.—Copper or silver amalgam restoration in mesial aspect of second deciduous molar.

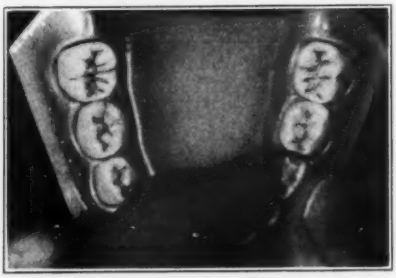

Fig. 7.—Method of holding matrix in position to fill distoclusal cavity in lower deciduous molar.

Fig. 8.—Matrix well adapted at gingival margin.

to give added strength to the restoration. (Fig. 3.) The outline form should be such that there are no thin enamel walls left unsupported by dentin.

If, at this time, a small cavity not extending near the occlusal surface is found on the mesial surface of the second deciduous molar (Fig. 4), it is prepared as a simple proximal cavity by the use of a small round bur in the straight handpiece

Fig. 9.—Finished restoration.

Fig. 10.—Distoclusal restoration of lower first deciduous molar. The mesial surface of the second deciduous molar is not carious.

(Fig. 5), to remove the decay; followed by an inverted cone bur to obtain retention. This simple proximal cavity may be filled with silver or copper amalgam. (Fig. 6.) A temporary filling is then placed on the distal aspect of the first deciduous molar until the next visit, when it is removed and the filling previously placed in the mesial aspect of the second deciduous molar is polished.

A matrix should always be used when silver amalgam is inserted in compound cavities in the deciduous molars. There are a number of matrices and holders on the market, but none of them are adaptable to the first deciduous molar because

Fig. 11.—Pit cavity preparation. The fissures are not precarious.

Fig. 12.—Occlusal restoration extended to include precarious fissures.

of its peculiar shape. I have found that the best matrix is made by cutting a small strip of thin matrix band material, adapting it to the tooth and holding it in position with the fingers while packing the amalgam. (Figs. 7-8.) With a little experience, one is able to hold the matrix

firmly around the tooth. If there is a tendency for the matrix to pull away at the gingival margins, a small wedge may be inserted between the matrix and the proximal tooth just below the contact point. This type of matrix may be removed buccally or lingually without dis-

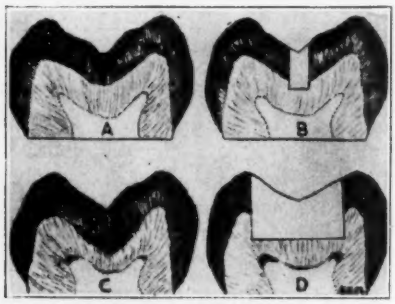


Fig. 13.—*A*, precarious fissure. *B*, fissure (*A*) cleaned out with bur and small filling inserted. *C*, appearance of occlusal surface at *A*, but with extensive caries penetrating dentino-enamel junction. *D*, extensive restoration, necessary because of neglect of undermined fissure *C*.

Fig. 14.—Mesioclusal pit prepared to include fissure running toward marginal ridge; lingual fissure included in preparation of distoclusal pit.

lodging the filling, as is later described in an upper restoration. (Fig. 23.)

A well-fitted matrix prevents overhanging of fillings and restores the proximal surface of the tooth to its original form. (Fig. 9.)

Sometimes when caries is detected early in the distal surface of the first deciduous molar and the tooth is properly restored, the mesial aspect of the second deciduous molar may be protected from the onset of caries. (Fig. 10.)

Early attention to small pit cavities in

Fig. 15.—Lingual step preparation for distal aspect of upper deciduous cuspid.

Fig. 16.—Mesioclusodistal preparation of upper first deciduous molar.

the occlusal surface of the lower second deciduous molars may prevent the decay from extending throughout the fissures. (Fig. 11.) If the fissures are precarious, the cavity preparation should be extended and the tooth restored accordingly. (Fig. 12.) I do not believe that silver nitrate or cement washes should be used in fis-

sures because decay usually begins at the base of the fissure and penetrates along the dentino-enamel junction. One cannot definitely determine the depth of the fissure and the extent of the caries without the use of the bur to open the fissure. The treatment of pits and fissures before decay has progressed extensively is one of the most valuable preventive measures in dentistry for children. (Fig. 13.)

Fig. 17.—Anterior restoration.

Fig. 18.—Distoclusal and mesioclusal preparation of deciduous molars with broad occlusal step.

When caries attacks the occlusal pits and fissures of the upper second deciduous molar, provided the decay does not undermine the transverse ridge, the cavity preparation of the mesioclusal pit should be extended to include the fissures running toward the marginal ridge, and the distoclusal pit is usually prepared to include the lingual fissure. (Fig. 14.)

Cavity preparation for the distal aspect of the cuspid is probably the least understood. It is absolutely essential that added retention be obtained in preparing this cavity. This is best done with a lingual step. (Fig. 15.) Silver amalgam in this cavity is not visible from the labial aspect.

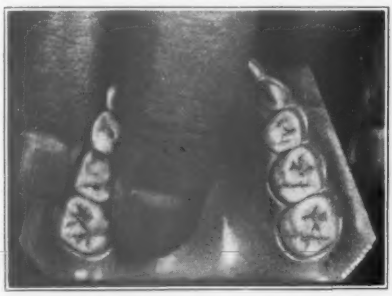

Fig. 19.—Position of fingers for holding matrix.

Fig. 20.—Mesioclusal restoration of second deciduous molar. The mesial aspect is polished before the distoclusal restoration of the first deciduous molar.

Mesioclusodistal cavity preparations are not so common in the deciduous teeth because conservation of tooth structure is important. But when both proximal sur-

faces of the tooth are carious, as is often the case in the first deciduous molar, the mesioclusodistal preparation is made. (Fig. 16.) The cavity preparation is the same as for a mesioclusal and distoclusal, except that the first deciduous molar is too small to obtain retention for separate restorations and, as a result, the cavities are joined for added strength.

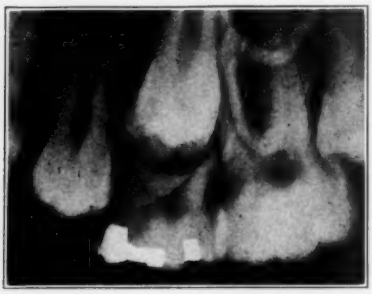

Fig. 21.—First bicuspid in contact with mesial surface of second deciduous molar on eruption.

Fig. 22.—Matrix adapted to distal aspect of first deciduous molar and held in position with fingers while amalgam is being packed.

When decay of the anterior deciduous teeth is shallow, the cavities are prepared for a simple restoration of copper amalgam. (Fig. 17.) At no time should these teeth be cut wedge shaped. If the decay is more extensive and the angle of the tooth has been destroyed, and it thus is impossible to obtain retention without exposing the pulp, the surface may be smoothed with stones and disks and then protected by an application of Howe's silver nitrate solution.

In the deciduous molar region, regardless of whether it is upper or lower, with extensive proximal caries involving the

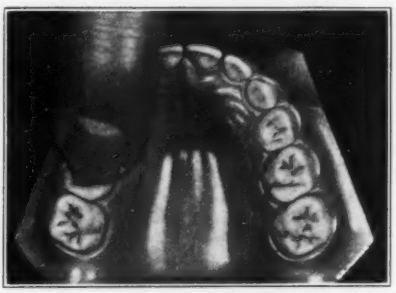

Fig. 23.—Position of fingers as matrix is removed buccally with pair of pliers.

Fig. 24.—Occlusal view of finished distoclusal and mesioclusal restorations in upper deciduous molars.

distoclusal and mesioclusal surfaces of the first and second deciduous molar, both cavities should be prepared with an occlusal step (Fig. 18) for compound restorations. The preparations should be broad occlusally to give added strength

to the filling material. This prevents the breaking down of the restoration, which so frequently occurs when the occlusal step is narrow. After these two cavities are prepared, the mesioclusal in the second deciduous molar should always be filled first. The matrix previously described is used, being held firmly in place by the fingers. (Fig. 19.) The placing of a pellet of cotton in the distoclusal cavity of the first deciduous molar while the amalgam is being packed in the mesioclusal cavity of the second deciduous molar will prevent the matrix from bulging mesially. It is not advisable to fill both of these cavities at one sitting, as the mesial aspect of the mesioclusal filling in the second deciduous molar should be well polished (Fig. 20) before insertion of the distoclusal filling in the first deciduous molar; because, sometime in the life of each child, if exfoliation and eruption are normal, the distal surface of the first bicuspid will be in contact with the mesial surface of the second deciduous molar for a year or more. (Fig. 21.) Contact of a well-polished filling with the first bicuspid will reduce the susceptibility of that tooth to decay.

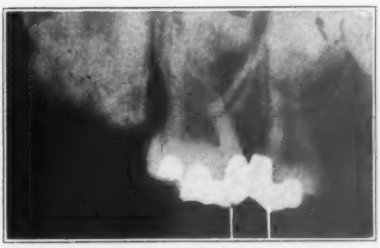

Fig. 25.—Finished distoclusal and mesioclusal restoration of upper deciduous molar. The distal pit of the second deciduous molar is filled separately.

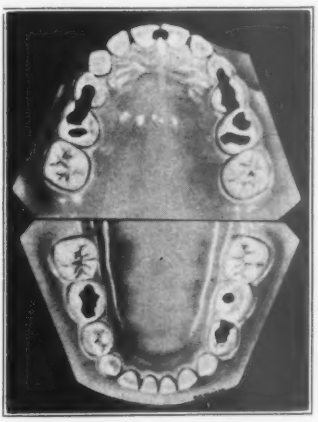

Fig. 26.—Restoration of cavities most frequently found in average child's mouth.

We are now ready to place the distoclusal filling in the upper first deciduous molar. The matrix is adapted to the tooth and again held in place with the fingers. (Fig. 22.) After the filling is packed, the matrix is removed by placing the index finger over the occlusal aspect and drawing the matrix buccally with a pair of pliers. (Fig. 23.)

Fig. 27.—Abscess of second deciduous molar due to neglect of proximal caries.

If these cavities are correctly prepared and silver amalgam fillings are properly inserted, carved and polished (Figs. 24-25), the teeth should remain healthy until the normal time of exfoliation.

I have tried to describe and illustrate cavity preparation for the deciduous teeth in areas most frequently found carious

in the average child's mouth. (Fig. 26.) There are other cases, familiar to every pedodontist, and to many general practitioners who do work for children, that require special operative care. In the most common of these, there are deep-seated cavities in which the decay may be best removed with a No. 6 or 8 round bur and the pulp protected by a mixture of zinc oxide and eugenol, which, at the same time, will serve as a base for the filling material. In cavity preparation in the deciduous teeth, it is absolutely essential that all decay be removed. Many pulps are needlessly exposed because the operator has failed to differentiate between decayed and discolored or stained dentin.

Neglect of the proximal surfaces of the deciduous molars is certain to cause pulp involvement, followed by an abscess (Fig. 27), with a possibility that the infection might be carried to other parts of the body, with resultant loss of the tooth and finally malocclusion. These abscesses and infections are more serious during childhood, as the child has not had an opportunity to build up the resistance and immunity that are acquired by an adult.

2039 North Prospect Avenue.

DISCUSSION

*Samuel D. Harris.*—Our knowledge of cavity preparation in deciduous teeth has increased considerably in the last decade. Were the question asked ten years ago "Is the fracture of a filling, its dislodgment or failure for any reason more excusable in a deciduous tooth than in permanent tooth?" I am certain that my answer would without hesitation have been "Yes"; for, on the basis of experience, this was the only answer that could truthfully be given. More errors in the care of deciduous teeth were evident by the records. Why? Because, psychologically, children were treated as miniature adults: technically, deciduous teeth were treated as exact replicas of permanent teeth, only smaller. Ten years of added knowledge has taught that this point of view is wrong to the degree that, in the past, it led to too many failures. Today, with children and children's teeth better understood, success is general. The difference between correct management of children and of adults is slight, and the difference between correct cavity preparation of deciduous and of permanent teeth is likewise slight, and furthermore these differences are easily learned. Yet, a careless dismissal of these as of little importance can but prove a serious barrier to consistently good dental service for children. Dr. Morgan has listed the differences. A perusal of some of our errors in cavity preparation for the deciduous teeth over a period of the past ten years may perhaps further help to stress the vital importance of these differences. Psychologically, we have learned that it is conducive to failure to subject a new child patient to difficult cavity preparation without first "conditioning" him to dentistry. How much better, before undertaking this more difficult service, to spend a visit or two in prophylactic service and in completing the smaller fillings that are generally necessary, in order to establish the child's confidence. I have yet to find the dentist catering to a large proportion of children who has not learned to admire the Spartan courage and the high tolerance of these little people when, favorably prepared, they must undergo a difficult cavity preparation. It makes us believe more and more that children make better dental patients than do adults. Technically, we have learned that our greatest difficulty is not with deep occlusal cavities, nor even with deep proximal cavities. Strangely, that greatest number of cavities that must be refilled, i.e., the work must be done over, are those of moderate size occurring on the proximal surface of deciduous teeth and which encroach close to or actually involve the masticating marginal ridge of the tooth. At the root of our failure, there was generally, it appeared in time, a weak cavity wall, an unfinished margin, insufficient retention or perhaps the absence of an adequate cement base. I am certain that we knew better in these cases, but invited failure perhaps knowingly, temporizing

with our knowledge, hoping to save the child a painful moment or two or the mother any added or unnecessary expenditures. We have learned that we accomplished neither, and are today less tempted to temporize in these matters. In consequence of our findings, I am convinced that weak cavity walls can be tolerated even less by the deciduous teeth, which are more brittle and more delicate than the permanent teeth. All enamel walls must be solidly supported by dentin. Unfinished cavity margins can be tolerated even less by deciduous teeth, for the same reasons. All margins must therefore be finished carefully with well-selected stones and chisels. Retention is as necessary in deciduous teeth as in permanent teeth. A broad step onto the occlusal aspect in the case of molars, and onto the lingual in the case of anterior teeth, is essential where the cavity preparation on the proximal surface extends to the masticating marginal ridge of the tooth. Pulp protection in the form of a cement base is even more essential to deciduous teeth than to permanent teeth, especially when the proximal area of the prepared cavity is more than twice the depth of the thin proximal enamel.

# ALVEOLAR BONE IN RELATION TO DENTURE PROSTHESIS*

By V. C. SMEDLEY, D.D.S., Denver, Colo.

WHY is it that there is such a marked variation in the alveolar support for dentures in different mouths? We frequently hear it said that if a patient is ever going to wear dentures, the earlier in life they must do so, the better, as the ridges are stronger in youth, and if teeth are allowed to remain until they are lost by pyorrhea, there will inevitably be no adequate foundation for dentures.

This is a logical-sounding statement and conclusion but it is not necessarily borne out by the facts. In some of the most extreme cases of resorption of the jaw, and causing the greatest unhappiness that I have ever seen, the teeth were extracted when the patients were quite young, and the ridges that were prominent in the beginning have undergone resorption and melted away under full dentures. On the other hand, I have seen mouths, as I am sure you all have, in which the teeth were all lost by pyorrhea, and still the patients had very satisfactory ridges for denture support. What is the answer? I believe that there are two factors in this problem which are more important than the age of the patient and the question as to whether the teeth were lost from pyorrhea. They are bone mineralization and denture imbalance or trauma.

Given a jaw with dense mineralized bone, no matter what the age of the patient, and we need expect no difficulty with any type of partial or full dentures the wearing of which does not produce severe malocclusion and trauma. On the other hand, with open cancellous bone, which is very deficient in minerals, there will be nothing but dissatisfaction with tissue-borne artificial dentures, whether full or partial, no matter at what age the natural teeth were extracted. It seems obvious that, in such a case, all nat-

*Read before the Section on Full Denture Prosthesis at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

ural teeth that can be restored and maintained in a state of cleanliness and health should be retained and used as far as is mechanically possible for the support of partial dentures and the prevention of excess pressure on the poorly calcified ridge areas. Such patients should be educated to the fact that they have inherited, or at least possess, a defect that will require constant dental care in order that they may enjoy the best that is possible in the way of denture service. In such a mouth, partial dentures should be examined at regular intervals and should be refitted or remade as frequently as shrinkage, wear or other changing conditions may indicate; and both partial and full dentures on weak foundations should be so constructed as to reduce the pound or trauma on the supporting tissue to a minimum by avoiding broad occlusal surfaces or deep inlocking cusps that are so occluded as to cause a lateral thrust or skidding action of the denture. In addition to the foregoing measures, we should be sufficiently informed to be able to prescribe a proper mineralizing diet for these patients to provide a better foundation for our work.

We also hear the statement, "The younger the patient, the less difficulty he will have in learning to wear dentures." I do not think there is very much to the contention that age is an important factor in one's ability or inability to adapt oneself to dentures. Some of my youngest patients have been the worst complainers. On the other hand, an 80-year-old patient stands out in my memory. I had worked for her daughter for years, and one day they both came in and the daughter said that her mother had been without teeth for about fifteen years and she was afraid that it was bad for her health; adding that she was ashamed to have their friends see her look so forlorn and neglected. The mother spoke up and said that this was just a foolish notion, and that she did not need or want any teeth. To which I replied, "Well, that settles that: I certainly will not make you any teeth. I should like to have the money, but money couldn't hire me to make a set of teeth that I know in advance will be an absolute failure, for while I could make a set of teeth for you, I could not wear them for you. This is a fifty-fifty proposition: the dentist makes the teeth, the patient wears them, and neither can accomplish anything without the full cooperation of the other. Good-bye, I am glad to have met you and had this little visit with you, and if you should ever decide that you want a set of teeth bad enough to do your part in learning to wear them, I will be very happy to make them for you."

Several months passed and she came back with her daughter again and said that she had decided that she wanted a set of teeth, and if I would make them for her, she would wear them. She did, and I have never had a patient of any age who apparently had any less difficulty becoming adjusted to denture wearing. She had, by the way, favorably shaped ridges and well-mineralized alveolar bone.

We also hear it stated, and see evidence to substantiate the statement, that when the upper jaw is edentulous and the lower six, eight or ten teeth only remain, the lower anterior teeth will pound and traumatize the upper anterior ridge, rapid and disastrous resorption resulting, and, at the same time, the lower posterior ridges will be similarly traumatized, with resultant excessive resorption.

We have all seen mouths, of course, that were wrecked by the pounding of natural lower anterior teeth against a full upper denture and wherein the lower posterior ridges were badly wasted away. But this wreckage could have been largely avoided by provision and maintenance of

maximum tooth support anchorage; and by rebasing or remaking as often as necessary to maintain an adequate posterior occlusal support, to protect the upper anterior ridge from unnecessary and harmful stress. This involves also a selection of tooth forms and their placement in such a way as to minimize occlusal stress and trauma on the supporting alveolar process. If this is done as carefully as it can and should be done, the only cases wherein there will be excessive resorption are those in which there is poor mineralization, and absorption under full dentures would, in all probability, have been still more excessive.

On the other hand, when there is a heavy dense alveolar process, which will not become resorbed under full dentures, this particular mouth will react well under partial dentures, with or without the supporting type of attachments or even with more or less imbalance from the loss and nonreplacement of some of the teeth in the opposing jaw. Melvin E. Page[1] says:

> To obtain many years of satisfactory denture service, the foundations of the restoration must remain stable; for without this stability of foundation, the functioning of the dentures is, in great measure, lost. They no longer have the ability to maintain balance under stress. Even the centric relation becomes changed, resultant malocclusion in turn increasing the rate of change in the process of the underlying foundations. . . . In the large majority of patients, stability of process is negligible, but, in some cases, rather rare it is true, the process remains stable for long periods of time. That this accidental stability occurs is known to every denture maker. . . . The problem before us is to make it possible to produce this stable condition of process in patients for whom, under prevailing practice, the dentures would remain stable but a very short time. . . . Systemic treatment is advisable in nearly all denture cases. The patient usually loses his teeth because of a disturbed mineral metabolism and will likewise lose his ridges if this condition is not rectified.

Boyd S. Gardner[2] writes:

> Proper denture exercise makes for a lessened blood supply, with resulting deposition of mineral salts. The intake of minerals also should be sufficient. This result can be observed by careful roentgenographic examination of the bone which supports teeth before their extraction, and by reexamination at certain intervals after insertion of dentures. A similar condition is noted in the bone that supports teeth which have been subjected to a great amount of work, as seen in the chewer of tobacco. This is the type of bone that makes a better and more lasting foundation for dentures, provided, of course, the dentures are so built as to give proper exercise. Another provision is that the necessary minerals and vitamins be included in the food intake of the patient. It is obvious that such results cannot obtain if the patient has some endocrine disturbance that interferes with mineral metabolism.

I have had forcibly impressed on me many times during the last eight or ten years the importance of maintaining a correct posterior occlusal support in partial denture cases as well as when full dentures are worn; not only for the sake of conserving the alveolar foundation to the best possible advantage, but also for the relief or prevention of mandibular joint disease from overclosure or unbalanced closure of the jaws, which may have various symptoms, e.g., deafness, buzzing, snapping or roaring in the ear, neuralgic pains, headache, earache, dizziness, burning sensation in the tongue or walls of the throat or herpes of the external canal of the ear.

1. Page, M. E.: Necessity for Endocrine Treatment in Successful Prosthesis, J.A.D.A., 23:439 (March) 1936.

2. Gardner, B. S.: Prosthodontist's Interest in the Mineralization and Demineralization of Bone, J.A.D.A., 22:995 (June) 1935.

For highly interesting and full reports on a long series of this type of case, I would refer you to a series of papers by J. B. Costen, M.D., of St. Louis.[3]

One case from my own practice is typical.

The patient, early in 1928, was wearing rather extensive bridgework in the upper jaw, which had been made several years before with no attempt to restore a collapsed jaw to normal relation, and a partial lower denture restoring the area back of the cuspid on the left side and the two molars on the right side. This denture was entirely tissue bearing on the left and partly supported by a clasp lug on the right second bicuspid. The two occluding bicuspids had worn and intruded until the bite was appreciably shortened, especially on the left side. The patient was suffering from acute earache and neuralgic pain on the left side of the head and face. She had been suffering in this way for several years, the pain in recent months having become more persistent and intense, until, as she expressed it, she was "nothing but a nuisance" to her family as well as to herself and she was considering seriously the advisability of doing away with herself. She declared that she had been spending money for years, going to different doctors, with no relief and she was certainly not going to spend a lot of money now on her teeth, especially when she knew positively that they could have nothing to do with this condition. She finally consented to let me make an inexpensive vulcanite occlusal splint, which opened the bite to what looked to me to be normal. She left the office wearing it but with no faith whatever in its ability to benefit her. In spite of her conviction that it could not possibly help her, the pain in her head began to subside after a few hours of wearing the splint and in time completely disappeared. She did not believe then that the splint had anything to do with its stopping and so left it out, and very shortly the pain returned. She repeated this in and out test at irregular intervals over a period of several weeks, after which she came in and said that she could not understand or believe it, but that the awful pain in her head must be caused by the closure of her jaws, because every time that she had worn the splint for several hours, the pain disappeared and every time she left it out, the pain returned.

I reconstructed her bridgework and made a new definitely tooth supported lingual bar case and dismissed her, entirely comfortable and happy. By 1932, some wear and saddle shrinkage had occurred, permitting a slight closure of the jaw, and there were symptoms of recurring pain. The bite was restored at that time by rebasing and reconstructing of the lower denture. It was necessary to do this again in February of this year. But the patient is well pleased and is now very willing to have any reconstructing done at any time that it may be necessary to do so in order to maintain the jaw relation.

In another case, a woman, when I first examined her mouth, was wearing a full upper gum section set of teeth that my father had made for her forty years before. During all this time, she had had no lower molars, just the ten anterior lower teeth; and I have never seen a better fitting denture, no matter how recently or by whom it may have been made. I refer only, of course, to its fit to the mouth. The point is that there had been absolutely no resorption of the supporting alveolar process during all these

3. Costen, J. B.: Neuralgias and Ear Symptoms Involved in General Diagnosis Due to Mandibular Joint Pathology, J. Kansas M. Soc., 36:315-321 (Aug.) 1935; Group of Symptoms Frequently Involved in General Diagnosis, Typical of Sinus and Ear Disease and of Mandibular Joint Pathology, J. Missouri M. A., 32:184-190 (May) 1935; Syndrome of Ear and Sinus Symptoms Dependent on Disturbed Function of Temporomandibular Joint, Ann. Otol., Rhin. & Laryng., 43:1 (March) 1934; Glossodynia: Reflex Irritation from Mandibular Joint as Principal Etiologic Factor; Study of Ten Cases, Arch Otolaryngol., 22:554-564 (Nov.) 1935.

years in spite of the fact that there was no molar support. What is the answer? It is, I believe, the fact that this patient had dense, highly mineralized bone and that there were no cusps on the old gum section bicuspids to cause the denture to skid and shift and traumatize the supporting tissues.

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# POSSIBILITIES AND LIMITATIONS OF VARIOUS MODES OF PARADENTAL TREATMENT*

By RAOUL H. BLANQUIE, D.D.S., F.A.C.D., San Francisco, Calif.

THERE is probably no other field in the practice of dentistry presenting so many specialized methods of treatment as that branch which deals with the elimination of diseases of the supporting tissues of the teeth. The term "specialized methods" refers to the various measures that are advocated to treat the symptoms of degenerative paradental change. It will be generally found that these different methods are not always advocated according to the progress of the symptoms, but that all of the various modes may be prescribed for the many divergent types of paradental lesions. The present practice of paradental treatment, to judge from current dental literature, appears to be influenced considerably by two different schools of thought. It would furthermore seem that the two points of view were at cross-purposes, rallying to their respective folds those who are known as "conservative" and those who are termed "radical," the appellation depending on the principle of the method they favor. The thought does not seem to prevail that these various procedures may all possess certain virtues and that the operator's judgment should guide him in the selection of the method best indicated for any particular type of case. A physician, in treatment of any progressive lesion, does not approach the problem with one therapeutic agent, but is guided in the selection of a remedy by the progress of the lesion.

It would seem that the expedient procedure in the treatment of diseases of the paradentium should be the proper selection of a therapeutic method rather than the employment of any one mode to be used as a specific for all types of conditions related to paradental disease. Instrumentation, medication, surgical methods and electrocoagulation, which comprise the variety of measures that we have at hand to combat the symptoms of paradental disease, all have their place and in their treatment we should base our choice upon present knowledge of the histopathology of paradental lesions. Hypothetical deductions based largely upon popular belief and which have not passed the test of both microscopic and clinical study should not continue to mislead us regarding illusory and mythical results. It should be clearly borne in mind that once disintegration of the alveolar process has started, we never again have normal relation of tissue structures unless the phenomenon of bone regeneration takes place.

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The hypothesis that has divided the dental profession regarding paradental treatment relates to the possibility of the epithelial or connective tissue lining of a paradental pocket reattaching itself to denuded cementum after this tissue has been exposed for a certain time to bacterial activity and the action of the fluids of the mouth. Scientific proof that this much-to-be-desired tissue phenomenon can take place under ordinary circumstances has never been demonstrated to the satisfaction of the majority of dental histologists. The principal conditions that seem to mitigate against its occurrence are: (1) the questionable possibility of the redeposition of new cementum over denuded cementum to form a biologic base for connective tissue attachment and (2) the apparent impossibility of preventing regeneration of epithelium on the crevicular surface of the pocket long enough to permit connective tissue attachment to the cementum.

If the two mentioned conditions can be overcome, it will be time to change the entire outlook on the problem of the treatment of degenerative changes of the paradentium.

It is commonly accepted that the principal objective in the treatment of paradental symptoms is the elimination of the pocket itself with its attending infective processes. The pocket, resulting from degenerative changes, and once started, can be also classified as an aggravating factor in the further development of these symptoms. A gingival crevice of abnormal depth is a natural harbor for food débris and provides favorable conditions for propagation of bacteria. Invasion by micro-organisms of the surrounding connective tissue of a pocket establishes a focus of infection, either active or potential. The health factor in the treatment of paradental infections should be our greatest concern and should overshadow every other consideration. It is no longer hypothetical that many systemic ailments have their origin in the oral cavity, and paradental infections being the most common of all dental infections, it is of paramount importance that all infective processes be eliminated during the course of treatment.

Scaling or planing, which characterizes the modus operandi of instrumentation, may be accomplished by various types of instruments suitable for that purpose. In the instrumentarium, we find the hoe, the chisel, the file, the sickle and the curet, and the choice is usually determined by the preference of the operator, who may use but one type or may employ them all. Although they vary in design, their principle is similar, involving the removal of all foreign material within the pocket, calcareous deposits adherent to the crown and root and all necrotic cementum, until a clean and smooth surface is obtained. Proper technic in instrumentation is a matter of developing digital dexterity so as to possess an adequate sense of touch, which alone can enable the operator to determine the exact result of his efforts subgingivally. The removal of foreign material, including the affected cementum, removes the direct irritating factors in inflammation and suppuration and the bacterial invasion of adjacent connective tissue. These symptoms generally subside after proper instrumentation unless the disturbance is complicated by overwhelming endogenous conditions such as diabetes or if superimposed on a Vincent's infection. The crevicular surface from the crest of the marginal gingiva to the line of attachment, at the bottom of the pocket, will reepithelize and the inflammatory process in the underlying connective tissue will gradually disappear. The subsiding of the inflammation usually causes a reduction in the

height of the pocket. In the absence of a reattachment, between the detached tissue and the cemental surface, the pocket is still present, and the length of time that this space can be kept in a healthy condition free from infection is in ratio to its being kept free from irritating elements which may reintroduce an inflammatory reaction. Regardless of the close approximation of the detached tissue to the surface of the cementum, it is physically impossible through ordinary prophylactic measures on the part of the patient to prevent the ingress of foreign material into the pockets.

It may be stated that if by instrumentation it is possible to remove the irritating factors within a pocket and produce epithelization over the exposed connective tissue on the crevicular surface, the maintenance of this condition is dependent to a great extent on the depth of the pocket after treatment, as any abnormal depth must be considered a potential irritating factor in its reinfection. Dental authorities do not seem to agree on the depth of a normal gingival crevice, as, to judge from their opinions, it varies anywhere from 0.5 to 2 mm. Clinical observation would lead one to believe that the norm varies as regards different persons and that one should rely somewhat on his own judgment as to what constitutes a proper depth in any particular case. It is probably safe to assume that any depth under 2 mm. might be considered normal. Depth alone cannot be advanced as the only index of a normal gingival crevice; color, contour, with an absence of clefts, inflammation and bleeding must also be taken into consideration.

In pockets that do not exceed more than 3 mm. and where the inflammatory process within the tissues will, after subsiding, produce a sufficient reduction in the depth of the lesion, instrumentation will generally prove most successful. In all other modes of paradental treatment, instrumentation is always indicated as an adjunct measure to remove the roughened and necrotic cementum and leave a smooth healthy surface in the subgingival space.

Chemical obliteration of paradental lesions has long been practiced, and many suitable drugs are to be found among those that have been recommended for this procedure. Any chemical coagulant or escharotic agent that can be so controlled in its application that it does not cause injury to the enamel or the cementum may be judged suitable in this practice. The principle of this treatment is to destroy by chemical action the overhanging detached tissue comprising the pocket. Mechanical pressure may be added as an adjunct to chemical action by packing the pocket very tightly with cotton twills to which has been applied the medicament of choice. P. S. Haley, of San Francisco, recommends for this particular technic a 50 per cent phenol solution. Destruction of the overhanging tissue by this procedure takes place from within the pocket outward.

For external applications, a solution of phenol and chloroform may first be applied within the pocket for its analgesic effect. Then, to the external portion of the pocket, a solution of sulfuric acid and ether may be applied with a smooth broach around which a few fibers of asbestos have been wrapped. The escharotic action of this drug will cause the overhanging tissue to slough off. When any escharotic, such as sulfuric acid, which will etch the enamel if it comes in contact with it, is employed, vaseline may be used to protect the crown. There are other drugs used singly or in combination which undoubtedly have been found as effective.

The number of applications of a drug required to accomplish the desired result

is dependent largely on the depth of the pocket, the density of the tissues to be destroyed and the relative strength of the drug used. Applications should be repeated until the pocket has reached normal proportions.

In persons who object to anesthetics, or react to them unfavorably, or who object to the sight of blood or to the thought of cutting, the chemical method will be found to have decided advantages. It may also be employed to good advantage as an after treatment, following other procedures when the gingival crevice has increased in depth owing to lack of proper care or for some other reason.

The principal objection to the chemical method might be its slowness; which makes it less expeditious than other procedures that involve the removal of the pocket.

The surgical means of treating paradental lesions comprises various technics, among them the so-called flap operation, gingivectomy, when a portion of the pocket is removed, and those technics whereby a pocket is extirpated either to its line of attachment or all tissue is included to the level of the remaining alveolar process.

The flap operation, whereby a mucoperiosteal flap is lifted, permits a ready view of the affected field in both soft and hard tissues. This facilitates thorough removal of all infected tissue to be found on the root surface, in the interproximal space and lining the external and internal mucoperiosteal flaps. Unless the excess tissue is removed after approximation of the flaps, there is liable to be some sponginess left. The same may be said of this procedure as of instrumentation in that shallow pockets may be eradicated, but deep pockets will remain and be subjected to the possibility of recurrent infection. In patients who have a short lip, this method may be used as a compromise in place of complete removal of deep pockets in the upper anterior region for esthetic reasons.

Gingivectomy usually removes but a portion of the pocket, leaving a residue of the lesion. Being but a half-way measure of treatment, it cannot be regarded as having conclusive possibilities.

In the practice of the surgical procedure, there seems to be a division of opinion as to whether it is advisable to remove all of the soft tissue to the alveolar process or whether it should be cut away only to the bottom of the pocket where the organic attachment begins. It is the contention of the exponents of the latter belief that to cut beyond the line of attachment destroys the possibility of reorganization of bone, the structural elements of which may be contained in that tissue between the bottom of the pocket and the alveolar process. This point is one that justifies scientific investigation, as the possibility of recalcification of bone merits serious attention. Unfortunately, the phenomenon of bone regeneration is seemingly rare, and to many operators its rarity makes it a matter of academic rather than practical interest. When it does occur, it will be more often found in the vertical type of atrophy rather than the horizontal.

In cutting the soft tissue down to the alveolar process, clinical experience seems to show that whatever portion was attached before the operation regenerates and reattaches itself as formerly. This result might be substantiated by the fact that the cementum in this instance was vital and that the connective tissue fibers were still organically embedded in that tissue.

There are many technics advocated for the surgical method. In the eighteenth century, when this mode was also in practice, scalpels and scissors comprised the entire instrumentarium. Today, we pos-

sess more refined methods. We are indebted to A. W. Ward, of San Francisco, whose specially designed instruments form at the present time the basis for many of the technics that are now being used. His surgical packing material has made the operation humane and greatly enhanced the possibility of more permanent results. The practice of periodontia has greatly benefited from his contributions.

The surgical treatment of paradentosis involves the principle of obliterating the paradental pocket in its entirety either to the line of attachments or to the level of the alveolar ridge. The alveolar process is not ordinarily involved in the operation except in those cases wherein the interproximal pocket is deeper than around the labial or buccal pockets of the adjoining teeth. Then a certain amount of alveolar plate may be chiseled away to bring it nearer to the level of the more advanced pocket. Failure to do this would permit the soft tissue to grow back to the highest level of the adjacent bone and necessarily reestablish a pocket in the interproximal space. In the vertical type of paradentosis, the interproximal incisions should not go beyond the level of the highest point of the alveolar structure, as damage might result to the remaining osseous structure and prevent recalcification.

The tissues comprising the pocket are dense and somewhat loose and to cut them accurately requires specially designed instruments that are accessible to the affected parts. The teeth and especially the investing tissues need careful attention after surgical intervention as the interproximal spaces are larger owing to the loss of tissue and the gingival border is further removed from the deflecting protection afforded by the height of convexity of the crown. This means that greater hygienic attention is required if food and débris are to be kept away from the tissues. Failure to exert the necessary care will often spell failure in an otherwise successful case. Too much time cannot be spent in training the patient to master the various measures that clinical experience has found indispensable in keeping the gingival tissues in the state of health. Stimulation through proper brushing is probably the greatest single measure to be taken against the recurrence of paradental infection after surgical intervention.

A very important step in the surgical procedure is the packing of the tissues that have been cut and exposed. Improper application of this protective and sedative measure will often lead to abnormal healing and untoward results such as sensitiveness of the uncovered cementum. The packing should be applied very tightly around the necks of the teeth covering the exposed root surface and alveolar surface and should overlap slightly the edge of the incised soft tissue. To do this, the packing material must be mixed to a very stiff consistency close to the saturation point. This will permit the material to be forced through the interproximal space, which should be packed very closely so that all involved surfaces will make contact with the sedative surgical packing. The length of time that it should be kept in position is dependent largely on the depth of the preexisting pockets and the minimum should not be less than ten days. The packing should not be disturbed unless sections of it should become loose or drop off, and these should be immediately replaced. Sensitiveness of the exposed cementum may generally be controlled by reapplications of the packing material at frequent intervals so that the eugenol, one of its ingredients, may have the opportunity of coming in contact with affected areas before the material sets.

The surgical procedure is not applicable in all cases of paradentosis, and care and good judgment are requisites in the selection of an operable mouth. The ability and willingness of the patient to maintain proper hygienic measures should always be ascertained prior to treatment. The alveolar support, length of roots, size of crowns, number of remaining teeth, relation of teeth as they establish occlusion, type of alveolar process and systemic disorders should be given careful consideration before treatment. Molars with bifurcations involved are generally hopeless. The lower molars may sometimes be successfully treated if the reflection of the cheek is below the opening of the bifurcation; in which case, the space may be more easily kept clean.

The surgical method may be said to be thorough, expedient and accurate and, if practiced judicially, will be found to give maximum service in those cases wherein its use is indicated. As was stated previously, instrumentation must precede or follow surgical procedure as it is imperative that a clean smooth cemental surface be obtained in order to eliminate possible gingival irritation.

Electrocoagulation must now be considered one of the expedient measures in the partial or total elimination of paradental lesions. The basic principle of this method is identical with all other procedures that involve obliteration of the pocket. Hemorrhage is eliminated, and whether this inaction is desirable is questionable. It is believed by some authorities that a certain amount of bleeding from the contiguous tissues of the excised pocket reduces congestion. It would probably be a little premature at this time to attempt to determine whether electrocoagulation offers advantages over other obliterative methods of treatment. There is no doubt that it will have its place in the group of approved methods, but further clinical experience will be necessary before final judgment can be passed on its full merits or demerits.

## CONCLUSION

An attempt has been made to bring out, although incompletely, the principal facts regarding the major accepted methods that are in general use in the treatment of pathologic paradental conditions. It is my belief that more satisfactory results are possible when we can detach ourselves from the idea of any single method to treat all forms of infections of the paradentium and substitute the judicious selection of the procedure indicated for the type of conditions that we desire to remedy. At the present time, while the etiology of paradentosis still looks toward scientific investigation and research for its final solution, our most tangible results are still obtained by the restoration and maintenance of the health of the paradentium. We should not overlook the correction of all those conditions that are known or believed to be either predisposing or exciting factors in the origin and development of retrogressive changes in paradental tissues. Many of these factors have been positively established as etiologic and should be corrected whenever possible.

We should lend our utmost efforts toward research in the field of periodontia as it needs the assistance of clinical experience to reach its objective. It is to be hoped that the combined efforts of these two fields of dental endeavor will hasten the day when, instead of primarily treating paradental symptoms, we shall be able to concentrate our efforts in their prevention.

# A METHOD OF DIAGNOSING AND TREATING CASES REQUIRING REPOSITIONING OF THE MANDIBLE AND REBUILDING OF THE OCCLUSAL SURFACES OF THE TEETH*

By E. E. BAILEY, D.D.S., F.A.C.D., Denver, Colo.

THE diagnosis and treatment of cases requiring repositioning of the mandible and rebuilding of the occlusal surfaces of the teeth necessitate that the dental mechanism be considered as a whole, if the final result is to be a coordinated unit, embodying all the correction and prevention that can be incorporated in a case.

The field is of such magnitude as to challenge the skill and judgment of those who would seek a solution to the problems involved. This is perhaps the reason so many dentists label treatises on the subject as complicated, refusing to put forth the effort necessary to qualify themselves to diagnose scientifically and carry out successfully occlusal reconstruction cases. This is a deplorable situation, as there is a great need for more attention to this problem. Many persons are suffering from a broken down dental mechanism with the attending anomalies: disease of the periapical and periodontal structures, inefficient mastication, the presence of worn down, unsightly anterior teeth, closure of the bite, with the accompanying distortion of the features and, in many cases, defective hearing and general discomfort. These patients, hundreds of them, are coming to dental offices every day. They are in need of a thorough cleaning up and scientific restoration of the dental mechanism. Would it not be good business for both patient and dentist if this were accomplished?

Do not consider my statements as irony, but rather as an urge for more interest in and study of this important branch of dentistry.

The prerequisite for successful diagnosis and treatment of cases requiring repositioning of the mandible and rebuilding of the occlusal surfaces of the teeth is to master a definite technic from diagnosis to finished case.

In the outset, records must be obtained from which a diagnosis can proceed. This involves a complete set of roentgenograms, accurate stone study casts mounted with the facebow on an adaptable instrument with an incisal guide, and a tabulated clinical picture of the case.

We are now ready to begin a study that should be continued until we have a clear-cut picture of the procedure necessary to complete the case.

Oral health is a most important objective in all cases. Therefore, prophylactic measures to eliminate and prevent disease are planned. This involves the surgical removal of diseased parts, the polishing of the necks of all the teeth and the designing of restorations which will be conducive to a healthy periodontium.

*Read before the Section on Partial Denture Prosthesis at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 14, 1936.

Next is the establishment of the vertical height of the bite. This is an important operation, as it has a scientific bearing on the function, health, appearance and comfort of the dental apparatus, and an affect on the facial appearance and perhaps the ear. At least, if not a corrective, it will be a preventive measure for protecting the hearing.

In an effort to determine the correct vertical height in the new centric relation, the bite is raised on the articulator to meet the mechanical requirements of the case. (It should be understood that

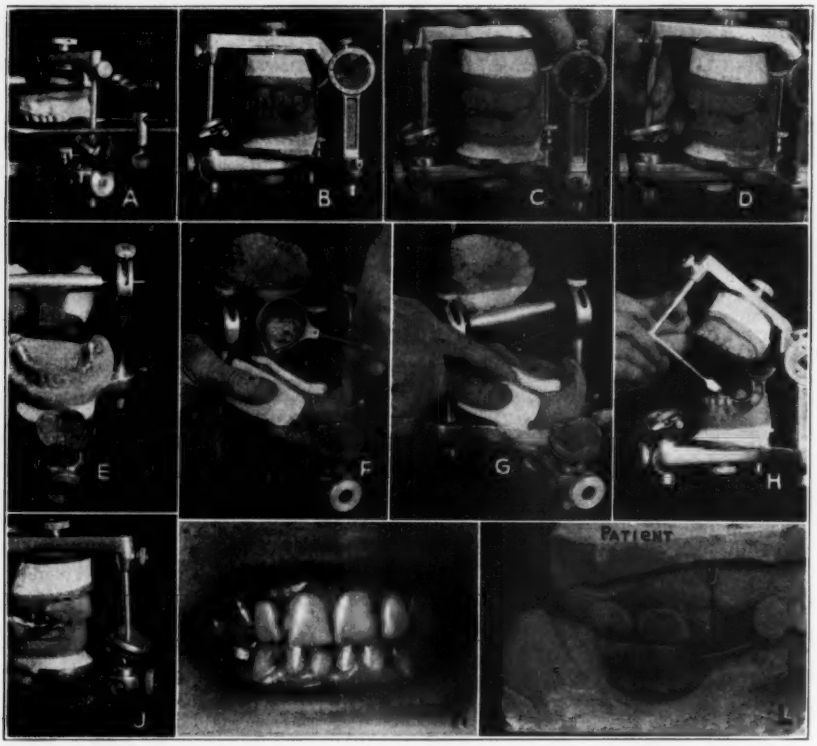


**Fig. 1.—Mounting study casts in position of diagnosis. *a*, facebow mounting of maxillary cast. *b*, mandibular cast articulated by aid of worn facets and mounted. *c*, adjustment of condylar paths of articulator. *d*, opening bite on articulator to meet mechanical refinements of case. Metal biteblocks are now constructed to occupy the opening and by which the true centric relation can be recorded in the mouth. *e*, adapting 60-gage tinfoil to occlusal half of bicuspids and molars. *f*, making matrix with damp napkin and pouring low fusing alloy. *g*, patting to place with finger. *h*, shaping with hot spatula. Occlusal surfaces should be smoothed flat with no indentations that might deflect the bite. *j*, establishing one point of contact on each side in region of second bicuspid or first molar. *k*, trying in mouth to test vertical height of bite. *l*, making gothic arch tracing in mouth.**

this is only an arbitrary opening and a stepping stone to obtaining a registration of the vertical height directly in the mouth.) The ideal is to establish an occlusal plane on which the incline planes of the teeth can be coordinated in all of the functional positions of the mandible. If this entails an opening that would jeopardize the outcome of the case, a compromise in favor of conservatism should be made, as in the natural denture it is not imperative that the posterior teeth balance in the act of incision.

There are many pitfalls in the radical opening of bites, and, when in doubt, it is better to keep on the conservative side.

The mental make-up of the patient is an important factor in a favorable prognosis. If he is the calm, collected type, it is safe to approach the limit in making corrections. On the other hand, if he is of the neurasthenic type, the prognosis is unfavorable for heroic treatment, and it is good judgment to stay well within the bounds of conservatism.

The condition and extent of the supporting structures of the teeth are an important factor in determining the vertical height in the centric relation. It is a decided error to build the crown too high above the alveolar process, thus subjecting the periodontium to stresses that will destroy them. A safe rule to follow in deciding how much of the root should be encased in the alveolar process, in relationship to the length of the crown, is a fifty-fifty division. Any change in the ratio should be in favor of more support for the root.

In certain cases, an improvement of the appearance is the sole objective of an occlusal reconstruction. In striving to assure the desired improvements, it is well to keep in mind the fundamentals which should influence the decision regarding the vertical height and the horizontal position of the mandible. Usually, these cases are of the Angle Class 2, closed bite types; and the temptation is to step the mandible forward and lock it with the cusps. It makes a great improvement in the facial outline to move a weak chin forward, but to do so is treading on dangerous ground. The outlook for stability and comfort is unfavorable, if the cusps are locked. If true centric relation is the basis for occlusal surfaces which function on a spherical congruency (as described by Maxwell) the prognosis is promising. This permits the mandible to function in all positions without interference. If the patient is persistent in an effort to improve the facial outline, he will consciously assume the anterior po-

Fig. 2.—Gothic arch tracing mechanism. *a*, method of extending tables to receive tracing. *b*, clamp-band with tube soldered, through which tracing pin operates. A rubber band is attached to the pin and tube in such a manner as to maintain gentle pressure of the pin on the table. *c*, mechanism operating in mouth.

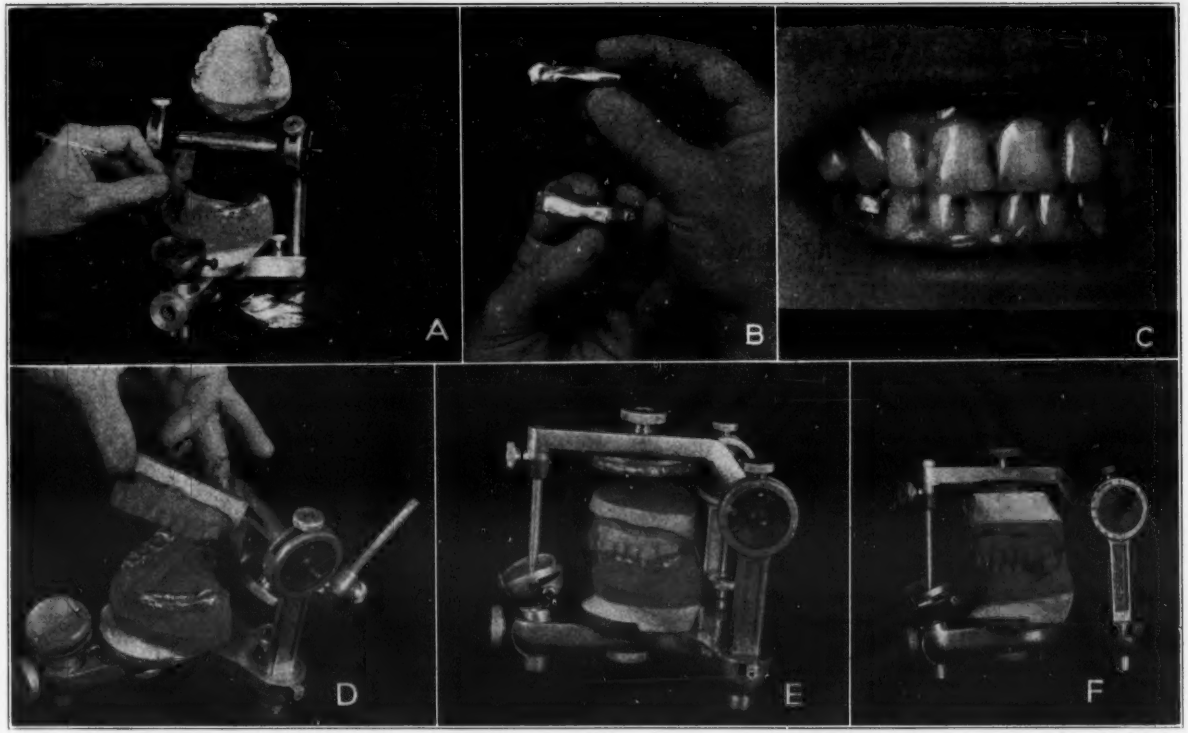


Fig. 3.—Registering centric and remounting upper cast in position of diagnosis. *a*, placing biteblocks on cast and adapting strip of black carding wax covered with 40-gage tinfoil. *b*, biteblock with wax covered with 40-gage tinfoil, which is softened in warm water. *c*, securing bite by having patient close to contact with biteblock. *d*, finished registration of bite. *e*, remounting of upper cast. Care is taken to set the incisal guidepost flush with the upper arm of the articulator in remounting. *f*, study casts in position in which case is to be constructed.

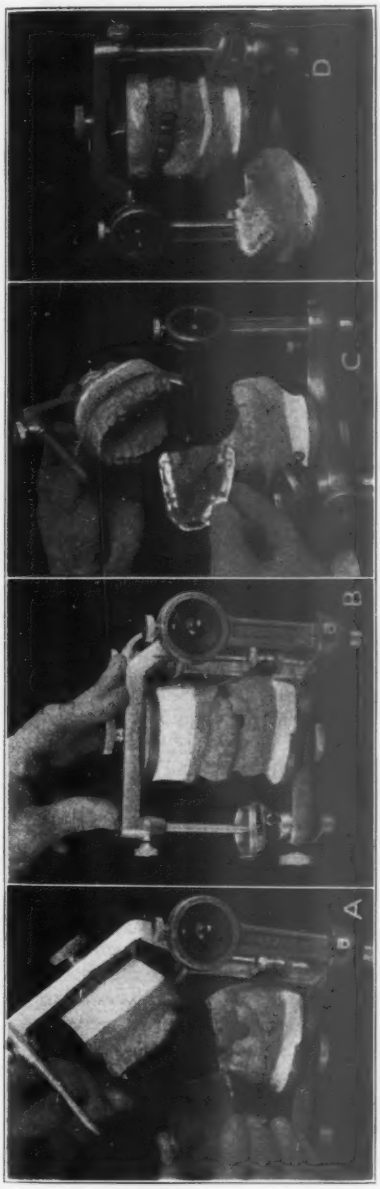


Fig. 4.—Construction of occlusal positioning guide. *a*, baseplate wax covered with 40-gage tinfoil, prepared and softened in warm water. *b*, placing in position and closing instrument to centric relation. The incisal guide table is set horizontally to avoid the spring of the instrument when force is used in closing the articulator. *c*, finished occlusal positioning guide. *d*, application. The master cast takes the place of the study cast in the occlusal positioning guide.

sition in function. In time, the true centric relation may move forward. This is merely a hypothesis, but at least there will be no interference when the mandible involuntarily functions in the true centric relation.

### MOUNTING STUDY CASTS (FIG. 1)

We have considered some of the factors in determining the vertical height in the centric relation and the bite has been raised on the articulator accordingly. Metal bite-blocks are now constructed to maintain the proposed opening in the mouth and by which the true centric relation can be recorded. It is prerequisite that any change in the relationship of the mandible to the maxillae must be registered directly in the mouth. The arbitrary opening on the articulator was only for the convenience of study. The metal bite-blocks are constructed of 60-gage tin burnished over the occlusal half of the crowns of the lower posterior teeth on the study casts (Fig. 1), reinforced with low fusing metal. The occlusal surfaces of the blocks should be flat and smooth, with one point of contact on each side in the region of the second bicuspid or first molar. There should be no indentations to influence the bite. The blocks are now tried in the mouth and the bite is tested.

### SECURING GOTHIC ARCH TRACING (FIG. 2)

When the operator is satisfied with the vertical height of the jaws, preparation is made for a gothic arch tracing so that the registration of the centric relation will be a scientific procedure.

The table for receiving the gothic arch tracing is an extension of the occlusal surface of the bite-block to the buccal aspect in a convenient position. The tube that the pin tracer works in is soldered to a clamp band and is attached to a tooth above the table that is to receive the tracing. The procedure for making the trac-

ing is to place the bite-blocks in the mouth and have the patient make eccentric excursion until a clean-cut gothic arch definition is secured.

### REGISTERING CENTRIC RELATION AND MOUNTING STUDY CASTS IN POSITION OF DIAGNOSIS (FIG. 3)

After the gothic arch tracing is completed, the blocks are removed and dried, and a thickness of black carding wax is placed on the occlusal surface of each,

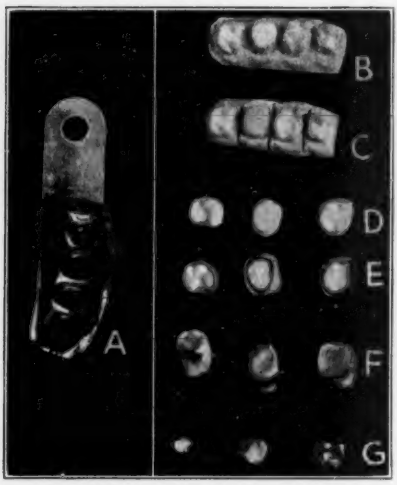


**Fig. 5.—Construction of temporary restorations of low fusing alloy (fusing range 154-158 F.). *a*, impression with compound in crown-bridge tray. *b*, plaster casts, around which paper matrix may be adapted and inlays and crowns poured in one piece, *c*. If desired, casts may be sectioned and each individual temporary restoration may be cast individually as shown in *d*, *e*, *f*, *g*.**

with the gothic arch tracing exposed to view, so that it is possible to see whether the patient is closing correctly when bite is taken. The wax is covered with 40-gage tin, softened by immersion in warm water and placed in the mouth, and the patient is asked to close to contact with the bite-blocks. The operator should be sure that the true centric relation is established, as all future bites are to be taken from or directed by study casts. The upper study cast is remounted according to the bite thus obtained. In mounting, the operator should always place the incisal guide pin exactly level with the top of the articulator arm, in order to know definitely when the instrument is registered in the centric relation.

### OCCLUSAL POSITIONING GUIDE (FIG. 4)

Study casts now occupy the position in which the occlusion is to be coordinated. Later, master casts will be constructed containing dies of teeth to be restored. They are to be mounted in the exact position that the study casts occupy. This is accomplished by a bite which registers the centric relationship that the study casts occupy on the articulator, and henceforth will be called the occlusal positioning guide. The bite-block is made of baseplate wax covered with 60-gage tinfoil. Only the tips of the incisors and the points of the cusps should be registered, as these areas will be reasonably constant on both study and master casts. Therefore, the occlusal surfaces of the casts will be interchangeable in the occlusal positioning guide.

It is granted that some portions of the teeth will be reduced in cavity preparation. There is usually at least one tooth on each side of the arch that presents an unchanged cusp to balance the master cast in the guide. Since the incisors are not restored until the posterior teeth are finished, this area will be constant, and all that is needed is one molar on each side to give balance in the guide.

Should a condition arise in which all teeth on one or both sides of the arch are restored with crowns or inlays, the re-

moval of which in the preparation would make the occlusal surfaces lower on the master cast, provision must be made to establish the relationship in the occlusal positioning guide. This is accomplished by placing carding wax in the guide to make contact with the most posterior tooth that has been lowered. The wax is now covered with 40-gage tinfoil, the guide placed in the mouth and the patient asked to bite slowly. The anterior inclined planes of the guide will direct the mandible to the true centric relation, and the changed occlusal surface will be registered. When this procedure becomes necessary, it is accomplished at the time

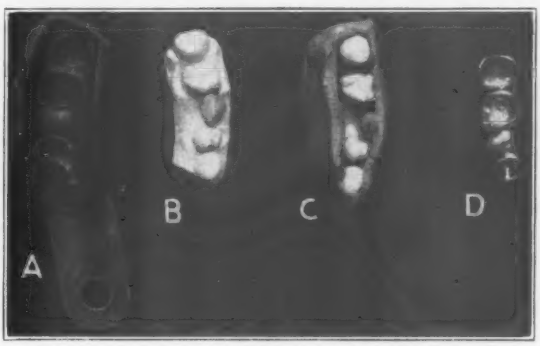


Fig. 6.—Construction of temporary bridge. *a*, compression with compound in crown-bridge tray. *b*, plaster casts, with porcelain tooth ground to place. *c*, matrix made with mouldine, into which low fusing metal is poured. *d*, finished bridge.

the master impression is secured, as then all cavities in one arch are open; it being understood that the procedure could not be carried out if the temporary inlays or crowns were in place.

### CAVITY PREPARATION

The operator has the advantage of visualizing the teeth in the exact position and relationship that they are to have in the finished case. This is a great aid in determining the type and extent of preparations. We must keep in mind the fact that band impressions are to be taken and must be an exact reproduction of all marginal areas. This necessitates the correct extension of proximal walls to permit a soft copper band to make a close contact with gingival and proximal cavosurfaces; thus preventing the impression compound from flowing into the undercuts.

Steps and seats can be made very shallow when angles are cut sharp, particularly when a large area is to be covered by the restoration. The shallow preparation is well adapted to an indirect technic, as closely adapted wax patterns can be secured even though they are very thin.

As designs are determined, they are outlined on the cast with a soft lead pencil or gold paint. The internal outlines of cavities are drawn with pen on roentgenograms by indicating depth of steps and seats.

The knowledge thus gained will enable the operator to cut with precision, deftness and speed, and the results of his careful diagnosis will be reflected in the finished product.

All preparations in one arch should be completed and the master model made

and mounted before work on the opposite arch is begun.

### TEMPORARY INLAYS, CROWNS AND BRIDGES OF LOW FUSING ALLOY

Cavity preparations are protected and the patient is made comfortable at the dinner table with temporary restorations of metal. This is a very necessary precaution, when so many teeth are open, awaiting restoration. Two methods can be used for their construction. They can be prepared in a few moments, as it is not necessary to invest to make the castings. For a single temporary inlay, a piece of compound is taken in the fingers to secure the impression. A plaster cast is made which will represent the preparation as well as the contacting teeth. A paper matrix is wrapped around the cast to wall off the interproximal space and low fusing alloy poured. It is cast by placing the finger over the metal to press to place. A metal that fuses at 154 F. is used.

### TEMPORARY RESTORATIONS OVER PLASTER CASTS (FIG. 5)

When preparing a group of teeth in a row, it will be found efficacious to take an impression of all cavities at one time, with compound in a crown-bridge tray. A cast of quick-setting plaster is poured, care being observed to fill without air bubbles. By the time the operator has completed the banded impressions, the plaster cast will be ready. The interproximal spaces are walled off with a damp napkin, and the low fusing alloy is poured into the cavity and finished in one piece. It will be found very convenient to seal a group of teeth in this way.

When it is desirable to make a single temporary crown, the impression is secured in a crown-bridge tray and poured with plaster. The tooth for which the crown is to be made is sectioned out of the cast with a saw. The contacting teeth are to be left intact. The gum line forms a shoulder to create a space between the side walls of the tooth and the paper matrix. The low fusing alloy is poured and cast with finger pressure.

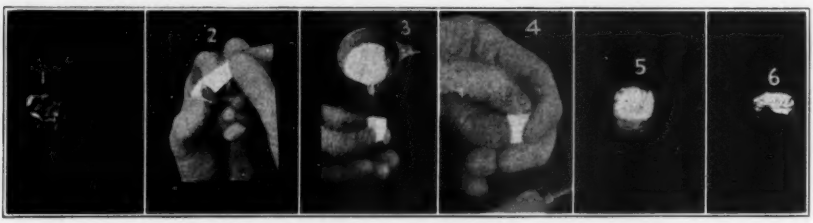


Fig. 7.—Construction of temporary inlays over copper amalgam dies. *1,* amalgam die. *2,* wrapping paper matrix. *3,* pouring low-fusing metal. *4,* casting with finger. *5,* inlay ready for finishing. *6,* finished inlay. If silver amalgam is used, the surface is painted with a solution of whiting and water and dipped in cold water immediately after casting.

### TEMPORARY BRIDGES (FIG. 6)

If it becomes necessary to make a temporary restoration in an edentulous area that is exposed to view, it is an easy matter to make a temporary bridge, replacing the lost tooth with porcelain. An impression of the area is made with compound in a crown-bridge tray, and a cast is made of plaster. An ordinary pin or diatoric vulcanite tooth is ground to fit, and a matrix is formed of moldine, which

will also hold the porcelain in position. Low fusing metal is poured and jarred to place. The bridge is ready for finishing. This type of restoration often serves a very useful purpose when people have social or business engagements when they are having dental work done.

### CONSTRUCTION OF TEMPORARY INLAYS OVER AMALGAM DIES (FIG. 7)

If dies are made of copper, low fusing alloy can be poured directly on the surface, with no danger of extracting the mercury. If they are of silver, it is necessary to paint the die with whiting and, immediately after the metal is poured, immerse in cold water.

After the amalgam dies are ready, this procedure is very simple. A paper matrix is wrapped around the die to form a matrix; a low fusing alloy is poured, and a finger is immediately placed over the metal, pressing it to place. The die is always removed when finishing, to avoid scarifying. Should a contact be loose, or a margin fail to be cast, metal is added with a hot spatula.

In making low fusing alloy or three-quarter crowns, 60-gage tinfoil is burnished over the preparation and trimmed to margin. The low fusing alloy is picked up with a concave spatula and spread to correct thickness and contour.

In finishing temporary restorations, coarse carborundum disks and large vulcanite burs are used.

### SETTING TEMPORARY FILLINGS

Temporary fillings can be set with any good temporary cement the use of which will not make their removal too difficult. Chloropercha is the material of choice, as it not only seals and holds well and permits of easy removal, but also has the qualities of being easily removed from the cavity. Pink guttapercha is used because it is readily distinguished from the dentin. The paste should be made very

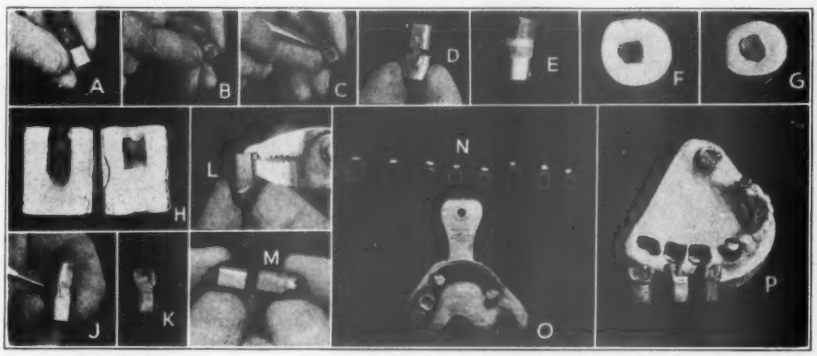


Fig. 8.—Construction of amalgam dies. *a*, method of positioning die socket and impression band. *b*, placing drop of sticky wax on die socket and impression band. *c*, thin strip of metal, heated slightly and placed as shown. *d*, die socket and band held in correct relationship. *e*, space closed between socket and bands with thin strip of wax. *f*, investment in cool mix of plaster. *g*, mold filled with copper amalgam. *h*, mold split after amalgam is set. *j*, smoothing amalgam between socket and band. *k*, finished amalgam die. *l*, removing die socket with die-socket plier. *m*, finished die, with die-socket removed. *n*, die sockets. *o*, *p*, application of die sockets.

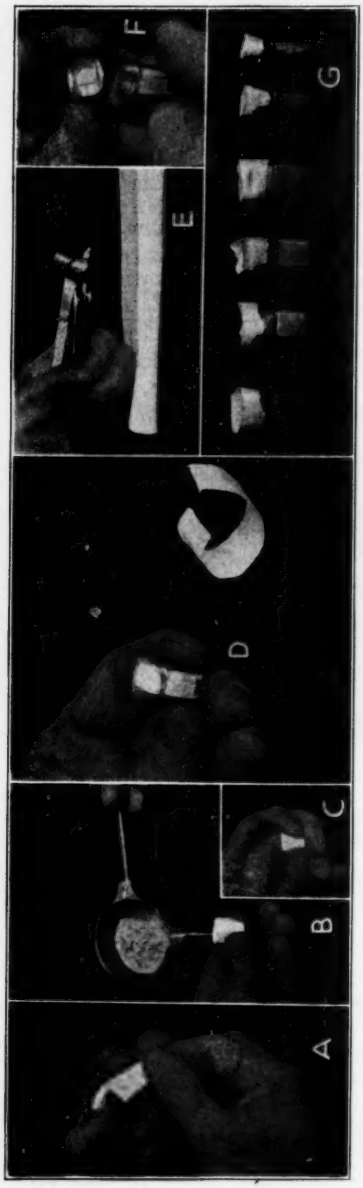


**Fig. 9.—Construction of transfer inlays. *a*, wrapping paper matrix, which is held mesiodistally to narrow transfer inlay in this dimension. *b*, pouring low-fusing alloy. *c*, casting with finger pressure. *d*, transferring inlay immediately after casting operation. *e*, removing transfer inlay from die. *f*, showing large area transfer inlay should cover. *g*, transfer inlays ready for use. The large, flaring, sharp margins on the occlusal aspect make it possible for the compound-hydrocolloidal impression to grasp and hold them firmly.**

thick. The toilet of the cavity is completed and the cavity surface of the filling is spread with chloropercha and it is forced to place. The surface is wiped off with a cotton roll, and the operation is completed.

### COPPER BAND IMPRESSIONS

Impressions should never be taken until the dentin has been protected against the forcing of débris into its tubulae. A safe method is to clean thoroughly, apply phenol, neutralize with alcohol, dry and varnish. The band impression technic has been a very indefinite and indifferent procedure in the hands of most dentists. A common error has been the use of loose-fitting and springy bands. The former permits the compound to flow into undercuts, distortion resulting at the buccogingival and linguogingival angles; which accounts for the fact that many castings fit the die perfectly, but present faulty margins when placed in the cavity. Furthermore, a loose band cannot be controlled when force is applied to adapt the impression material, often resulting in injury to the periodontium. The springy band will conform to the shape of the tooth when in place, but when removed from the impression, it tends to assume its original shape. This accounts for the opening between the band and the compound, which often occurs. If this space is not present, many times the spring of the band has carried the impression material with it. When a casting is made over a die from such an impression, we again have the flare at the gingival margin when the inlay is placed in the tooth. To secure accurate impressions, soft copper bands are used, which will assume and maintain the shape of the tooth, annealing always being done after the final fitting. The bands should conform tightly at the gingival angles to confine the impression material to cavity margins, thus

not permitting it to flow into undercuts.

If the die is to be made of amalgam, modeling compound is used to secure impressions. If the die is to be electroformed, wax may be used to take the impressions. Fine impressions of good preparations are essential if the result is to be a success.

### AMALGAM DIES

The root ends of amalgam dies are molded in metal die sockets, which later become their seats in the master cast. This not only saves the operator the task of tapering them by hand, but also gives a socket which, when accurately transferred to the master cast, will always provide for seating the die in its true position.

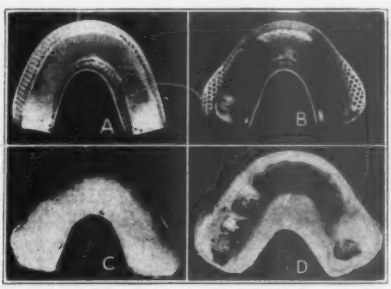


Fig. 10.—Technic of compound-hydrocolloidal impression. *a*, tray ready for use. *b*, black compound covering area in tray which will make contact with transfer inlays. *c*, colloidal material placed over softened compound. *d*, finished impression.

Copper amalgam is used for dies for the following reasons: Its volume is more constant than that of most silver alloys. Its use permits the pouring of low fusing alloy directly onto its surface without danger of drawing mercury. It is strong when properly worked, and its use offers the advantage of permitting the packing of a large number of impressions with a single mix. Furthermore, it can be used over and over again, which renders it economical.

Copper amalgam should be triturated and ground for several minutes, enough mercury being used to assure a very plastic consistency. It is always placed on a cold slab before being introduced into the impression, since, if it is at all warm, it may distort the impression.

### CONSTRUCTION OF DIES (FIG. 8)

A die socket, the approximate size determined by the gingival constriction, is positioned to the impression band and held in apposition by a flat strip of metal, secured to each band with sticky wax. The die socket should be parallel with the long axis of the tooth, at least 2 mm. of space being left between it and the impression band. The space is closed between the die socket and the impression band with a wrapping of thin wax. This is invested in a paper ring filled with thin plaster, one sixteenth inch of die socket being exposed to facilitate packing. Setting of the plaster should not be accelerated, as heat might distort the impression. Copper amalgam is used for filling, large pieces being pressed in the mold and jarred to place. When the impression is filled to the top of the die socket, cotton is placed over the amalgam, which is pressed firmly and jarred thoroughly to condense the die. When the die is hard, the amalgam is disked smooth between the impression band and the socket. The die is thrown out of its socket with a die socket plier and is ready for construction of the transfer inlay.

### ELECTROFORMED DIES

The electroforming of dies is a comparatively new, but a very promising method. The process will assure accuracy to a fine degree as the copper is deposited on the metalized surface of the impression while it is in an inert state.

Another scientific step that can be accomplished is the use of the electrolitic solution at mouth temperature. Thus, the die would be formed at the same temperature at which the impression was secured; which should eliminate dimensional changes.

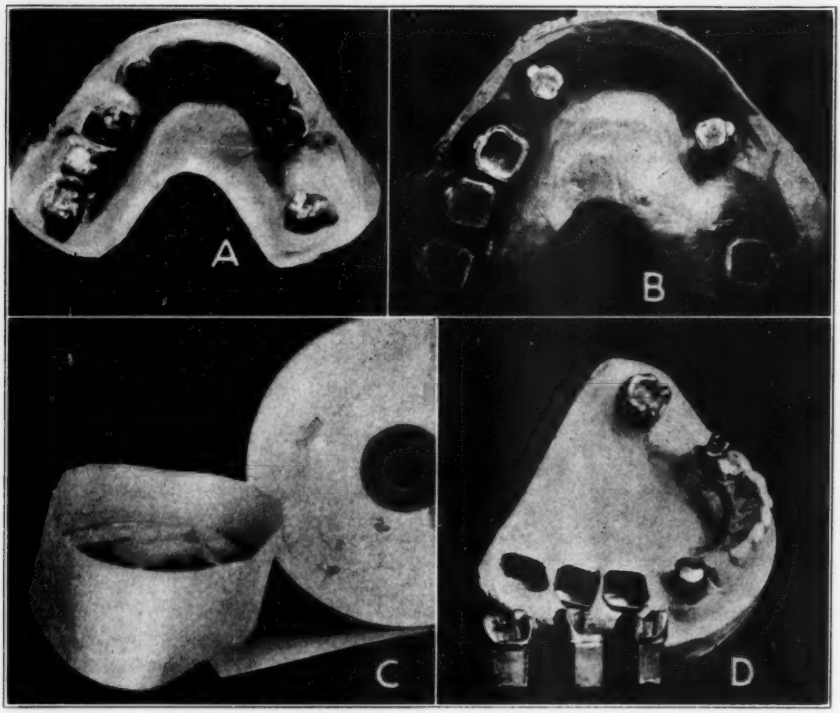


Fig. 11.—Placing dies in impression and constructing master cast. *a*, impression with transfer inlays in place. *b*, dies with die sockets in place seated in their respective inlays. The dentocoll is scraped to expose the compound on the buccal and lingual aspect of the dies, which are waxed firmly to place. The wax should extend up to the gingival margin of the die sockets. *c*, boxing with package sealing paper; cast poured with quick-setting stone. *d*, completed master cast. The die sockets have a coating of paraffin for lubrication. Slightly heating dies to soften the paraffin renders first removal from the master cast easy. The sockets and dies are cleaned with chloroform.

### ATTACHING DIE SOCKETS TO ELECTROFORMED DIES

After the die has been formed, a die socket slightly smaller than the impression band is selected and the socket and band paralleled, 2 mm. of space being left between the two. They are supported and sealed with surgical tape and filled with an alloy having a fusing range above 212 F. This higher fusing range is necessary to avoid the melting down of the reinforcing metal, when later operations in which heat is necessary are performed on the die.

TRANSFER OF DIES TO MASTER CAST

In order to gain a true transfer of dies to the master cast, it is necessary to have some definite way of knowing when they are accurately seated in the master impression. This is accomplished by constructing transfer inlays and crowns directly on the dies and placing them in their respective positions in the mouth and securing an impression. The inlays and crowns will be removed with the impression. Dies with sockets in position are seated in their respective inlays and a stone cast is poured.

Transfer inlays should include all of the coronal areas that are parallel to or convergent with the walls of the cavity. They should never have interproximal contacts, which interfere with seating. This is avoided in the molding by grasping the paper matrix mesiodistally to narrow it in this dimension and widen it

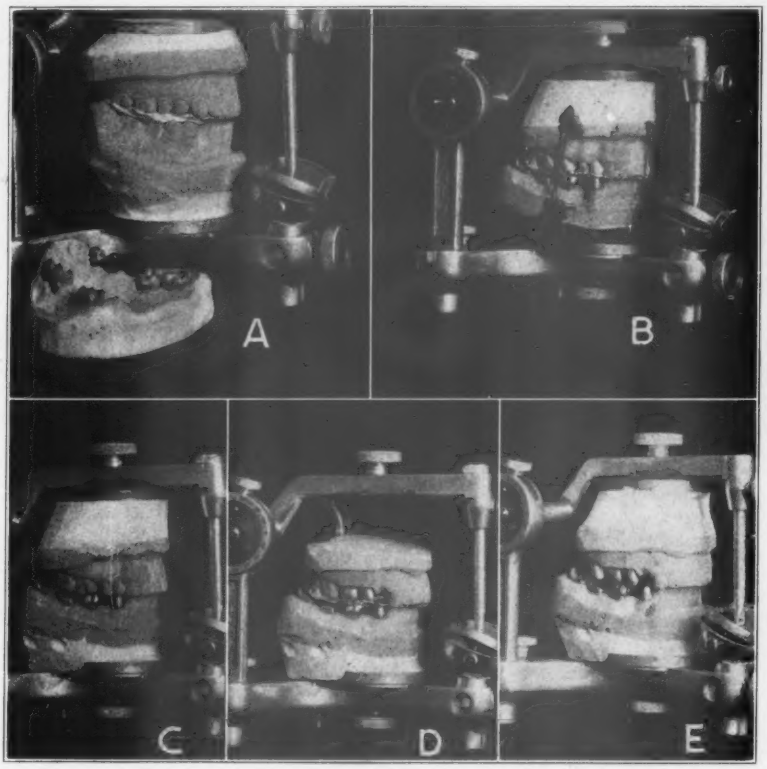


**Fig. 12.—Mounting master casts with occlusal position guide.** ***a,*** **study casts in position of diagnosis with occlusal positioning guide in place; mandibular master cast ready for mounting.** ***b,*** **study cast removed and master cast occupying its position.** ***c,*** **mandibular master cast mounted in position of diagnosis.** ***d,*** **maxillary master cast occupying position of upper study cast in occlusal positioning guide.** ***e,*** **master casts occupying position of diagnosis.**

buccolingually. Occlusal surfaces of transfer pieces should be large and concave, with sharp edges, to facilitate the impression material's grasping and holding them firmly. This shape results when the finger is placed over the top of the paper matrix in pushing the metal to place. All transfer inlays and crowns should be of uniform height. This is accomplished by trimming the paper matrix to the same height above the occlusal surface of each die. The reason for having all approximately the same height is to permit the impression tray to come in

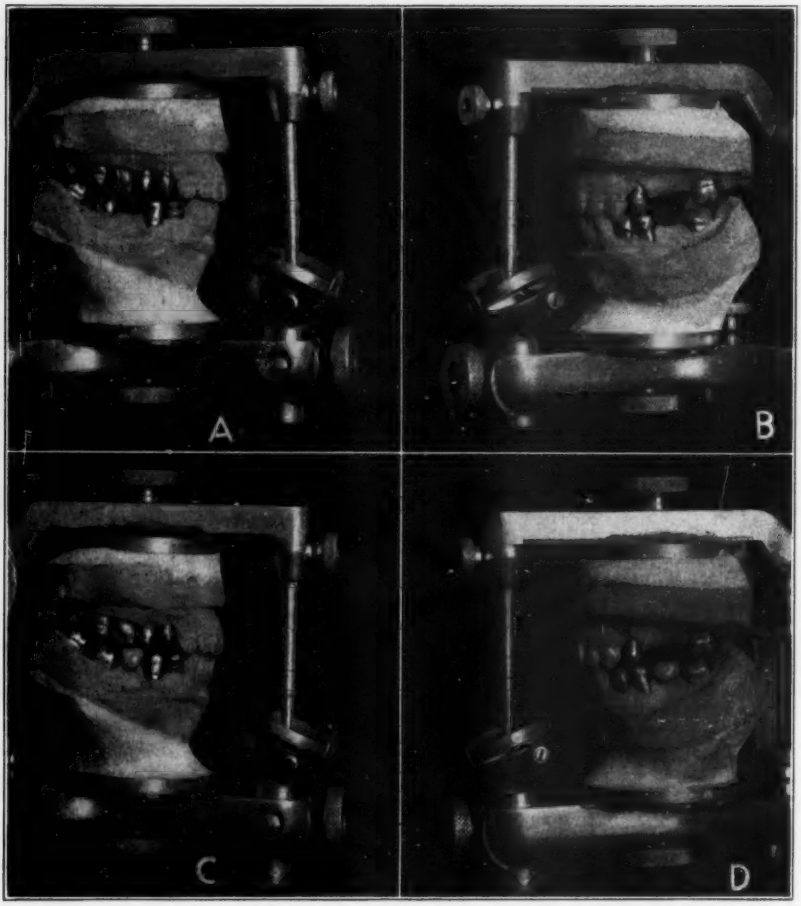


**Fig. 13.—Constructing case.** *a*, **right view of master casts.** *b*, **left view of master casts.** *c*, **right view after building up with wax.** *d*, **left view. The pontics are built along with the patterns.**

contact with them when the master impression is secured.

CONSTRUCTION OF TRANSFER INLAY (FIG. 9)

A paper matrix is wrapped around the die and is held with the thumb and finger, causing pressure mediodistally to narrow this dimension. The alloy is poured and immediately the finger is placed over the top of the matrix to confine the metal and force it to place. The ball of the finger causes a concavity of the occlusal portion of the transfer inlay and leaves the rim of it flaring and sharp. If the operation has been performed correctly, the inlay should be ready for use.

CONSTRUCTION OF THE TRANSFER CROWN

The die is wrapped with 60-gage tinfoil, the occlusal surface being left exposed. The paper matrix is placed and the alloy poured, casting being accomplished with the finger. It will be noted

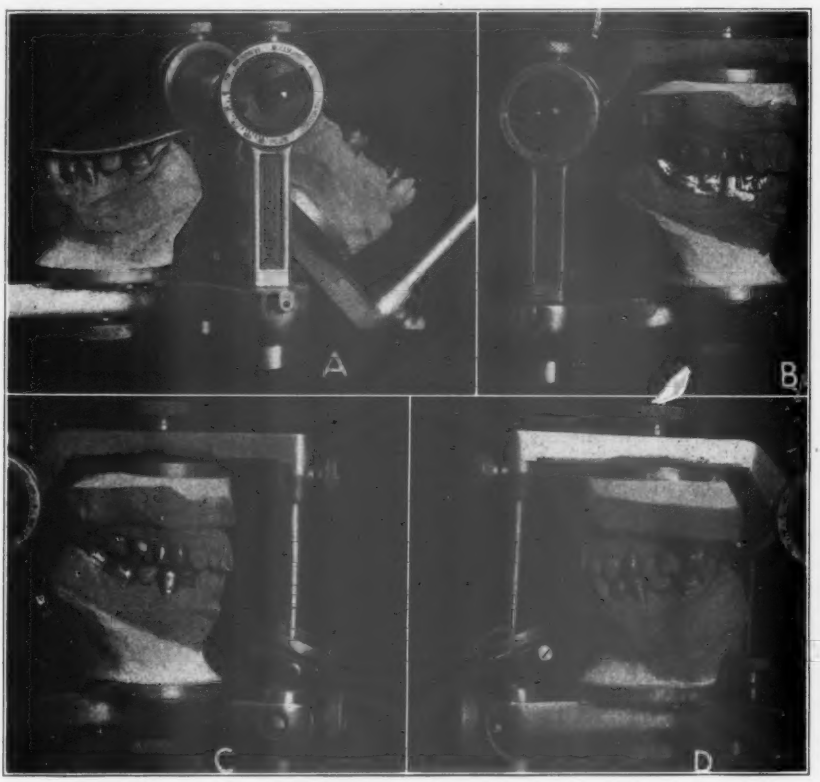


**Fig. 14.—Constructing case. *a*, use of template in establishing compensating curve. *b*, lower patterns covered with thin tinfoil and lubricated with cocoa butter. *c*, right view with patterns completed. *d*, left view with patterns and pontics in wax.**

that the metal only forms the occlusal portion of the crown, which has been given the proper shape. The tin covering the side walls of the die is now closely adapted by burnishing. It is then removed and trimmed to the gingival outline; replaced, and, with a hot spatula, alloy is spread over the tin to stiffen.

The same technic is used for three-quarter crowns, with the exception that the part of the tin which covers areas not in the cavity is trimmed to the height of the convexity to avoid undercuts.

The inlays and crowns are positioned in the mouth and an impression is taken.

### TECHNIC OF MASTER IMPRESSION (FIG. 10)

Transfer inlays are placed in their respective positions in the mouth. A webbed tray is adjusted so that it will make contact with the occlusal rim of all the transfer inlays and crowns. This accomplished, we are ready to proceed with the impression.

A roll of black compound is softened at the time the assistant is preparing a colloidal impression material for use. A roll of compound, the size of the forefinger, is placed over the areas of the tray, to make contact with the transfer pieces. The compound is covered with the colloidal material and introduced into the mouth, and the floor of the tray is pressed to contact with the transfer pieces. It is very important to seat the floor of the tray in order for the compound to displace the colloidal material and grasp the inlays and crowns firmly. After thorough chilling, when the impression is examined, it will be noted that the transfer pieces are held firmly in the grasp of the compound.

### SEATING DIES IN MASTER IMPRESSION (FIG. 11)

The dies with sockets in position are placed in their respective transfer parts in the master impression. If there should be any interference of the root ends, the die sockets are ground until it is eliminated, as each die must be seated without interference.

When dies are all in place, they are to be waxed firmly. As wax will not stick to a colloidal material, it becomes necessary to scrape buccally and lingually from each transfer inlay, thus exposing the compound which is just underneath. Die and compound are dried and filled in with wax up to the margin of socket. This will hold the dies firmly in their seats and, at the same time, prevent the cast material from covering any irregularities that would make their removal difficult.

### REMOVING IMPRESSION FROM CAST

Before attempting separation of the impression from the cast, the whole should be placed in hot water to thoroughly soften the compound, thus releasing its grasp on the transfer inlays. Otherwise, the dies may be fractured.

### FIRST REMOVAL OF DIES FROM MASTER CAST

Hot water is used to wash away the wax from the cast and dies. The sockets have a coating of paraffin and their first removal from the master cast is rendered much easier when they are warm. If there should be any difficulty in displacing a die from its socket, it may be easily reached with a round bur, introduced in the back of the cast. When the die is reached, it is pushed out.

The next step is to clean all paraffin and wax from dies and sockets, with the use of hot water, followed by chloroform.

### MOUNTING MASTER CAST (FIG. 12)

As stated, once the study casts are mounted in the position in which the case is to be constructed, no further bite reg-

istrations are necessary from the patient for the mounting of the master casts. This is made possible by the occlusal positioning guide, which we are now ready to use to place the master cast in the position the study cast occupies on the articulator. This step was described under the heading "occlusal positioning guide."

### CONSTRUCTION OF CASE (FIGS. 13-14)

Master casts containing dies of all teeth to be restored have been mounted and the articulator adapted. The incisal table and the condylar slots now become a guiding factor in coordinating the occlusal surfaces on a compensating curve, which will be in harmony with the movements of the mandible. The incisal guide table is adjusted to produce cusp height, to fit the age of the patient. The vertical height between the arches has been increased and the consequent space is to be occupied when restoration is complete. In most cases, it is good mechanics to divide equally the spaces between the arches. This distributes equally the lateral stresses, which will be increased by the additions to the vertical length of the crowns. Any rule in connection with establishing the plane of occlusion and cusp height must be flexible, as the type of case being treated will be the deciding factor.

All dies are lubricated with cocoa butter, and the building of the wax patterns of the lower arch is begun. A simple method of applying the wax is to warm the die and wrap it with waxed paper to form the matrix, pour the wax and press to place with the finger. Use of a template will assist in establishing the occlusal surfaces on the approximate curve to be given the case. The occlusal surfaces are carved, the cusp height being established as planned. If the form to be given the opposing teeth is visualized, the designing of the occlusal surfaces will be done with forethought, and the intercuspal relationship of the final waxing will be simplified. If bridge areas exist, pontics are built along with the waxing operation. Patterns in the lower arch, when completed, are covered with thin tinfoil, well-adapted, and thus protecting the carvings and giving a metal surface against which to mold the opposite patterns. The tinfoil is lubricated and the waxing begun in the upper arch. A first molar is constructed to form, and the occlusal portion softened and carefully closed to centric relation. This will mold it to fit the lower carvings and will be a starting point for finishing a correctly designed occlusal surface. This procedure is continued until all patterns are completed. The tinfoil is removed from the lower wax. The movements of the mandible are now carefully reproduced, to sheer the wax, in harmonizing the occlusal surfaces. When the best possible coordinated occlusion has been established, we are ready to cast the patterns of one arch.

In order to have tight contacts in the finished product, it is best to reproduce every other pattern in one arch and polish the contacting surfaces. Then the contacting surfaces of the remaining patterns can be molded against the polished surface. The occlusal surfaces are not polished until all spot grinding is completed, both on the articulator and in the mouth.

Adjustment in the mouth can now be made.

### DELIVERY OF THE CASE

No matter how carefully and accurately each step has been performed, a final adjustment will be necessary in the mouth. There may be contacts to be adjusted, tension in a bridge to correct or the pressure of pontics on the tissue to be checked, and there is always a final adjustment of occlusion.

When the operator is satisfied that the best possible adjustment has been made in the mouth, finishing, polishing and cementing should be carefully carried out. The cementing operation should be performed in the same manner as the final perfecting of the wax patterns; that is, every other "restoration" should be cemented. This will give a final opportunity to test the contacts under more favorable conditions. After cementation has been completed, the fine adjustment of the occlusion is accomplished. First, the patient is required to chew fine carborundum powder. As the surfaces have been polished, the cuts made by the powder will be apparent. The movements are continued until an even distribution of pressure and balance obtains.

The etched surfaces made by the use of carborundum powder are not polished, as they will be of assistance in checking the occlusion at a later appointment.

Some marginal finishing after cementation is necessary. This should be accomplished in the main before cementation.

After seven years' use, I have found this technic thorough, accurate and efficient. It requires a minimum of the patient's time and energy. The master casts, when mounted on the articulator, constitute a blueprint, which, if the dentist so desires, he can turn over to a trained technician for completion of the case. The prescription cannot be changed, and will remain a check on both technician and dentist.

It is a pleasure to sit down comfortably in the laboratory and construct these cases.

The scheme follows through from diagnosis to finished case, as, step by step, the details are worked out, and presently the case is finished as planned.

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# TRIFACIAL NEURALGIA*

By BYRON E. LOOMIS, D.M.D., Portland, Ore.

"TRIFACIAL neuralgia," "trigeminal neuralgia," "tic douloureux" and "tic" are among the terms used to designate a pathologic condition of the fifth cranial nerve tract characterized by extreme pain of paroxysmal type.

To the fifth cranial nerve and its branches is commonly ascribed the mediation of sensation in the facial region. It seems probable that the autonomic nervous system, and possibly the seventh cranial nerve, share that function, but not equally, at least under certain conditions. A large variety of pathologic conditions may be productive of excruciating pain in the face and cranium whatever the pathway of conduction. Many of these are well defined and well understood; others are more indefinite and of controversial etiology. There is a tendency to divide those conditions of obscure etiology into syndromes. The most prominent of these is known as tic douloureux, and it is to this condition that I wish to confine most of my remarks. I will therefore

*Read before the Section on Oral Surgery, Exodontia and Anesthesia at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

mention the others only to emphasize the extreme necessity of a proper differential diagnosis before undertaking any form of treatment for tic douloureux proper. Disastrous consequences often attend failure to establish the proper diagnosis, no matter how expertly the treatment is performed.

Trifacial neuralgia was known in the middle ages, but no relief was afforded its victims other than primitive drugging, until 1874, when Barthlow successfully injected chloroform into branches of the trigeminal nerve. Later, Billroth and Neuber injected osmic acid solutions, the use of which was often followed by bone necrosis, and relief, if afforded, was of short duration. About 1896, Schlosser, of Munich, began a series of experiments, reported in 1903, developing the use of alcohol by injection, and, in 1898, Spiller reported division of the sensory root of the gasserian ganglion. In the meantime, Pitres, Berger, Levy, Baudoin and others worked out a definite technic for the injection of alcohol into the trigeminal trunks. Patrick, in 1907, introduced this work into the United States, and, since that time, an enormous amount of work has been done in the effort to establish the etiology and develop a practical means of control. A great amount of knowledge has been acquired and therapeutic and surgical measures have been developed to a point where long periods of relief or permanent cures may be attained in most cases.

Several forms of severe facial and cranial pain exist which resemble in some way the pain typical of trifacial neuralgia of the major type long known as tic douloureux. Facial pain of definite dental origin caused by infection in or about teeth and accompanied by local tenderness may be more or less constant and throbbing, but is always deep seated. Teeth in the process of eruption and partially erupted teeth cause local and referred pain sometimes (often because of pressure exerted), quite severe but always relieved when the pressure is removed. The presence of pulp nodules and calcic infiltration of the dental pulp may give rise to local and reflex pain, often obscure and yielding only to the removal of the offending tooth. Edentulous areas frequently seem to be the seat of more or less severe pain, which may be the result of trauma inflicted during tooth removal, or to the presence of a neuroma or pinched or abnormal neurofibrils. Sinus infections are sometimes accompanied by burning, flashing, second-division pain, but with a continuous pain always present.

Atypical neuralgia is a deep constant boring and with a distribution not limited to that area innervated by the fifth cranial nerve. It may extend over most of this area and into the mastoid region, neck and shoulders. Alcohol block of the stellate and second dorsal sympathetic ganglia or cervicodorsal sympathetic ganglionectomy has been recommended.

Sphenopalatine neuralgia, "Meckel's tic" or "Sluder's tic," sometimes called "lower half headache," is characterized by persistent postauricular reflex pain, steady and boring, and may be accompanied by symptoms of the foregoing atypical neuralgia. It may have its origin in diseased sphenoid or postethmoidal sinuses. Temporary relief is sometimes attained by cocainization or extirpation of Meckel's ganglion. The present treatment is generally otorhinologic.

Geniculate neuralgia has been described as sudden paroxysms of burning, tearing agony within the external auditory canal. It is most often of herpetic origin.

Glossopharyngeal neuralgia, while very rare, resembles in many ways tic douloureux, but with a difference in the distribu-

tion of the pain, which follows the course of the glossopharyngeal nerve. The pain is paroxysmal and very severe, and is apparently in the ear and neck, with a trigger zone often present in the tonsillar fossa. This neuralgia is not relieved by alcoholic injection of the fifth cranial nerve or any of its trunks, or by operation on the gasserian ganglion, but may be relieved by neurectomy high in the neck or intracranial section of the ninth nerve.

Neuralgia of herpetic origin often resembles trigeminal neuralgia, though the pain may be an almost continuous burning. Questioning will reveal a history of herpetic rash in the pain area, and scars may be seen. Roentgen irradiation over the gasserian ganglion has been recommended.

Tumors of the gasserian ganglion may produce major trigeminal neuralgia, but associated with peripheral areas of hypesthesia or anesthesia.

Psychalgia paresthetica, either steady or paroxysmal, may be mistaken for tic douloureux. Diagnostic injections of procaine may be used here for differential diagnosis.

Tic douloureux, a neuralgia limited to the distribution of the fifth cranial nerve, may affect any or all of the branches of this nerve. It is quite possible for the pain of tic douloureux to be associated with the pain from some other type of neuralgia, and this fact should be noted in diagnosis. The etiology of tic douloureux has not been established, but scar, trauma, infection, arteriosclerotic ischemia and other conditions are suspected as causal. Frasier has attributed the pain to a vasomotor spasm causing anemia of the ganglion through sympathetic influence. Adson has suggested a possible vasomotor origin and has also stated his belief that trigeminal neuralgia might be of central origin. The pain of tic douloureux is excruciating and paroxysmal, and is described by the patient as burning, tearing, lancinating or stabbing, the spasms usually lasting from two or three to fifteen or twenty seconds. There are varying pain-free intervals. The condition, unless treated, generally persists until death. The degree of pain is often spoken of by medical writers as being possibly the most severe known to medical science. The disease is usually progressive, with increasing severity of the spasms as time goes on and with shorter intervals of relief. At times, the patient may experience a spontaneous remission lasting for any length of time. The condition is generally unilateral, but may be bilateral. I have seen two cases of bilateral tic douloureux out of about 100. While tic douloureux may be seen in early or late life, it generally appears during advanced middle age, the third, second, and first divisions of the fifth cranial nerve being most often involved. The sex incidence is not remarkable. The spasms are confined to one or more of the areas innervated by the main and peripheral branches of the trigeminal nerve, and these areas, if affected, form trigger zones, any disturbance of which is likely to start a spasm or a series of spasms, though they may occur spontaneously. The paroxysms may occur at any time independently of any movement of the patient, but are generally brought on by efforts to eat, drink, swallow or talk, or by external irritation or contact with the dolorogenic areas. Light stimuli are more effective than more definite ones. Cold drafts of air or any loud noise may bring on a spasm. Consequently, many of these sufferers, in their efforts to avoid these disturbing influences, partially isolate themselves when possible and often abstain from partaking of sufficient food and fluids. One patient under my care would remain absolutely immobile and expressionless during the most severe at-

tacks, while others would cry out, violently slap or claw at their faces, or rapidly work their jaws or lick their lips. One woman frantically beat on the walls with her fists. Living in an atmosphere of constant fear of unprovoked attacks, these people rarely indulge in casual conversation, laugh or joke. The areas of pain are the supra-orbital, infra-orbital, lateral nasal, temporal and superior and inferior labial regions. They are also found in the chin and cheek, side of the tongue and that part of the scalp innervated by the fifth cranial nerve. Sometimes, the pain may appear to be associated with one or more teeth. Removal of these teeth in no way relieves the symptoms.

Certain observers have noted that patients suffering from major trigeminal neuralgia are not usually of the neurotic type; neither are they disorderly in their habits of dress and personal cleanliness, but the uncared for appearance of the head and face sometimes seen (due to inability to bathe and shave) is often a source of great embarrassment. A marked tendency on the part of the patient to shun the use of opiates seems characteristic.

It was nearly 1900 before the medical profession made much progress in the treatment of this disease. Since that time, much has been accomplished, and today nearly all cases can be controlled or cured by either therapeutics or surgical operation. Opiates are of little value and are generally contraindicated. While it seems rational to correct as far as is practicable any abnormalities in or about the teeth, jaws, sinuses and fifth nerve tract generally, I have yet to see more than very temporary relief afforded by such treatment.

During the World War, manufacturing plants in Germany, using trichlorethelyne as a solvent and cleaning agent, noted among their employes a number of cases of partial anesthesia of the nose, mouth, cheeks and skin of the face, accompanied by vertigo, nausea, vomiting and other symptoms. This seemed to be without motor disturbance. This phenomenon led to experimentation with trichlorethelyne as an inhalant in the treatment of trigeminal neuralgia. Less has been accomplished by this method of treatment than was hoped for, but, in many instances, remarkable relief has been reported and the treatment seems well worth trying. In my own experience and that of others with whom I have worked in quite a number of these cases, results, after thorough trial of the treatment, have been very disappointing, and only the large number of favorable case reports coming from reliable sources has encouraged us to continue. The action of trichlorethelyne is not perfectly understood, but it has been accredited with a selective action on the sensory fibers of the fifth cranial nerve. While this would seem to be physiologically improbable, it might be a possibility. Analgesia and general anesthesia can be produced by its inhalation. Twenty or thirty drops of trichlorethelyne on a piece of gauze is held to the nostrils by the patient, who is in a reclining position. In case of partial anesthesia, the hand will drop and the inhalation cease. The fumes are to be inhaled until no odor remains, and this treatment should be carried out three times a day for from two to four or five weeks. The liquid is an irritant and should not come in direct contact with the nostrils or lips. Commercial trichlorethelyne should not be used because of the possibility of its containing harmful substances.

Injection of alcohol into nerve tissue causes its degeneration, and its skilful use by the block method seems at this time to be second in importance only to surgery of the sensory root of the fifth nerve.

Injection of the gasserian ganglion proper is a highly technical and hazardous

procedure at best. It is likely to be followed by reactions more severe than those caused by radical surgery, failing, besides, in objective. With the exception of the ophthalmic division of the fifth nerve, fortunately the least often affected, the other divisions may be reached extracranially, either deeply or peripherally with reasonable safety. Either the intraoral or extra-oral route may be used. Well placed deep injections in the second and third division immediately after their exit from the foramina rotundum and ovale, respectively, are generally most satisfactory, though the more superficial injections in the infra-orbital, mental and mandibular foramina often give excellent results.

After successful alcoholic block, periods of relief should be experienced, varying from nine to eighteen months, and occasionally lasting several years, this depending on the time required for regeneration of the nerve.

When these measures fail to alleviate the pain, the cause may be in the ganglion proper, and only sensory root operation will be effective.

When the alcohol can be placed directly within the nerve tissue, very small amounts are required, and 1 or 2 c.c. is ample and more effective than larger amounts placed only in the general locality of the nerve branches. The anesthesia resultant from this form of treatment enables the patient to become accustomed to loss of sensation in the face and helps to prepare him for the more complete anesthesia that follows operation. Certain operators incorporate a small amount of cocaine in the alcohol used. If the operator is in doubt as to the exact nerve branches affected, diagnostic injections of 2 per cent procaine may be made and the effect noted. When the procaine is used, it will be difficult, owing to anesthesia, to locate the nerve with the needle point, and alcohol injection may be made at a subsequent visit. Injections of alcohol may be repeated if indicated, but owing to the formation of scar tissue, the pathway becomes more difficult to follow and absorption is impeded.

Peripheral neurectomy seems more difficult and less effective than alcohol blocking, except, possibly, when the supra-orbital nerve is involved.

Radical modern surgical procedure consists of either total or subtotal resection of the sensory root, leaving the motor root intact. When this operation is contemplated, it is essential to bear in mind the undernourished and dehydrated condition seen in many of these patients, with its attendant increase of surgical risk.

Total sensory root division leaves the eye without sensory protection, and if the ophthalmic division is not involved, the sensory fibers that supply it may be saved by subtotal resection. The motor root is not disturbed.

Under the care of a competent neurosurgeon, few operations promise more to the patient. A very low mortality, complete relief, no visible scar and a painless procedure can be promised.

## CONCLUSION

A sound knowledge of the subject will almost totally eliminate faulty diagnosis and save the patient from useless operations and treatments, loss of valuable teeth, unnecessary expense and loss of time.

The trial of trichlorethelyne by inhalation seems justified and the judicious use of alcohol nerve blocking is wise and necessary.

When these methods of treatment fail to give comfort, surgical risk being fair, radical operation on the sensory root of the gasserian ganglion should be advised and the operation not too long delayed.

# PREPARATION OF VITAL TEETH FOR THE RECEPTION OF PORCELAIN JACKET CROWNS*

By WILLIAM A. SQUIRES, D.D.S., New York City

WHEN we consider the radical changes that are taking place in the general attitude of the public toward the all-important question of health, we become acutely aware of the increasing responsibility of the individual dentist to his patients. Because of the general information made available to the public, patients are becoming more critical of dental practice in general and particularly of the dentist's individual technic. Perhaps it is not assuming too much when I say that we recognize more clearly than ever before that everything possible must be done so that the public shall recognize that dentistry is on a par with medicine. The dentist must become more deeply concerned as to the impression he makes on his patients, and he must make still greater effort to impress on the minds of his patients the relation of correct technic to health and appearance.

In short, the dentist must stand in relation to the patient exactly as does the medical adviser. Two very definite things must be done if this is to be accomplished: The dentist must carefully educate the patient. He must go farther than merely give an estimate of work to be done in the patient's mouth—he must create in the mind of the patient a deeper appreciation, a clearer realization of the importance of the work that he is about to do. He must help the patient to become aware of the relationship between teeth and general health.

Again, the dentist must do everything in his power to improve his own technic. He must consider his responsibility both to the future health of the patient and to the dental profession as a whole. A technic that is intended to solve only an immediate condition in the mouth of the patient must become a thing of the past. Before a dentist attempts to make any form of prosthesis, and particularly when he attempts to use the porcelain jacket crown in restoration of a vital tooth, he should ask himself whether he honestly believes that he would be satisfied with his own ability to the point where he would select himself to do the same work in his own mouth. He should develop that critical, analytic attitude toward his own work that is so necessary if disastrous or unfortunate results are to be avoided. He should have clearly in mind each step that he intends to take before he takes it.

May I repeat a previous statement? Modern dentistry demands conservation of the pulp as well as of the investing tissues of the teeth whatever the type of restoration required. No intelligent and conscientious practitioner would devitalize a healthy normal pulp for the sole purpose of making a restoration. The porcelain jacket crown is one of the most modern and finest means of restoration available to the dentist and the public, but its use is fraught with greater hazard.

*Read before the Section on Partial Denture Prosthesis at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

Each step in the preparation for the porcelain jacket crown requires a more critical accuracy and soundness of technic than do most restorations, and I, therefore, intend to present a direct, practical treatment of the exact technic involved.

The dentist must be absolutely certain that the porcelain jacket is clearly indicated. He must be absolutely sure as to what he intends to do in each phase of the preparation. He must carefully examine the mouth of the patient. He should make a careful study of the occlusion and note the direction of stress that will be brought to bear on the jacket. He should have the proper roentgenograms of the tooth involved in order to determine (1) the size of the pulp and the condition of the investing tissue, (2) whether the neighboring teeth are vital, and when the neighboring teeth are not vital, (3) whether the root canals have been properly filled, and (4) the condition of the apical tissues. Here are four danger points to be guarded against in the preparation of a vital tooth: (1) too extensive cutting of the tooth; (2) overheating of the tooth; (3) lack of proper care of the tooth before taking the cup impression, and (4) lack of a proper temporary covering of the tooth stump while the permanent crown is being made.

Let us bear in mind that a thinner veneer of porcelain properly supported is much stronger than a thicker bulk of porcelain improperly supported. As the upper anterior teeth are probably jacketed more than other teeth, we will take up the preparation of an upper incisor in detail. As other teeth in the same mouth may require a modified technic, I shall also show just what modifications are necessary for the preparation of such teeth. Owing to the difference in size of the dental arches, there is some difference in the way teeth resist the force of the bite. Upper anterior teeth, when pressure is applied, carry the load alone, while lower anterior teeth receive some support from the adjoining teeth. A few of the factors in determining the exact preparation of any individual tooth are: (1) the type of tooth; (2) the age of the patient; (3) the position of the tooth in the arch; (4) the amount of attrition; (5) the extent and type of work previously done on the tooth, and (6) the condition of the investing tissues.

The preparation of a vital tooth for a porcelain jacket crown is a strenuous operation for both the patient and the operator. In order to simplify it as much as possible, the dentist should have available all the necessary equipment and cut the tooth to a definite outline form, making each cut count. If the investing tissues are in good condition, and especially in younger patients, I always leave the collar of enamel under the gum margin. We are apt to injure these delicate tissues in the process of its removal, and it is a physical impossibility for us to reproduce as well the natural contour required for the continued health of the gingivae. It is possible to bevel and finish the shoulder in such a way that the danger of short end enamel rods breaking out is reduced to a minimum.

Even in cases wherein there has been considerable recession of the investing tissues, the shoulder outlines should not be carried beyond the cemento-enamel junction. It will be shown later that the shoulder is often cut short of the crest of the gingiva, not only on the lingual aspect of upper anterior teeth, but also on some of the posterior teeth around the complete circumference. Only the necessary cutting should be done. The shoulder, in most instances, should not be more than 0.5 mm. in width. This varies according to the size of the tooth and the age of the patient.

On the labial and lingual aspect of up-

per anterior teeth as well as the buccal and lingual aspect of most posterior teeth, I incline the shoulder toward the axial surfaces, using small inverted cone stones, inverted cone finishing burs in the engine and end-cutting files, chisels and hoes beveled at the proper angle, which gives more stability to the restoration. The incisal or occlusal surfaces should be given the general form of the tooth operated on, all angles being rounded to insure greater strength to the porcelain. In short bite cases, a transverse groove is cut across the incisal aspect and, in most cases, this is extended down the mesial and distal surfaces. In the lower anterior teeth, I nearly always cut the incisal groove. Undercuts or depressions that remain from previous fillings must always be filled before the toilet of the preparation is finished. The axial surfaces must never be overcut to remove such undercuts. The axial surfaces should be smooth; which makes it possible for the cup impression to be removed without distortion.

A drawing is made of the tooth on which the jacket crown is to be placed. The location of surface markings or stains to be reproduced in the finished crown can be accurately charted.

The incisal edge is reduced with a flat sided carborundum wheel. It is very important that the prepared incisal edge be at right angles to the direction of stress. The tooth stump should be left as long as possible to give the greatest support against the leverage of forces that may be brought to bear on the porcelain. An upper anterior jacket seldom breaks through the central part, but usually on the labial aspect near the junction of the middle and gingival thirds, owing to the direction of stress applied on these teeth. It is imperative to leave the tooth stump as long as possible. It should not be cut more than 1.5 mm. In making this cut, the mesial and distal corners are not to be removed, as they make it possible to see exactly how much of the tooth has been cut. Also, they act as a guide for the knife edged disk used to reduce the mesial and distal surfaces. Next, a line is made from the incisal edge just to the crest of the gingiva, approximately 1 mm. in width with a three-quarter inch separating disk, which must be thin and run true. A shoulder is defined on both the mesial and distal surfaces with these cuts. A common mistake is to cut too far below the gum. The inclination of the disk is important. It should be inclined slightly toward the center line of the tooth so that when both mesial and distal cuts are made, the prepared surfaces will converge as they approach the incisal edge. The labiolingual inclination is such that the labial surface will be slightly wider than the lingual.

Whether the tooth has been anesthetized or not, a constant stream of hot water is directed on the tooth and stone to prevent undue heating. Before the shoulder is completed, a copper band, one-half inch long and of 36 gage, is fitted. The band should fit the tooth quite accurately and be trimmed to the gum outline, then made smooth with disks. Every care should be used not to damage these delicate tissues either in fitting the band or in taking the impression. It should extend about 0.5 mm. beyond where the shoulder will be finished. At the incisal end, tongues are cut and turned over the incisal edges of the adjoining teeth. These will act as a guide and a stop when the impression is being taken. The band is marked on the labial side to identify this surface and is filled with impression compound, which is allowed to extend beyond the incisal end. The gingival end of the band and compound is heated in the flame. Part of the compound is now withdrawn; which makes it possible to set the cup on the prepared tooth more easily when the

impression is taken. The excess compound is trimmed from the incisal end and is set aside until we are ready to take the impression. With a small inverted cone stone, a cut is made across the labial aspect, just short of the crest of the gingiva, following the gum outline. This cut is carried through the enamel, but should not extend into the dentin. A similar cut is made on the lingual aspect, with the same kind of stone. If the bite is satisfactory and the tooth stump is of sufficient length, more enamel is left on the lingual aspect and we do not approach so closely the gum margin.

The finished preparation should have the general form of the tooth being operated on. The labial surface should be slightly convex and the lingual slightly concave. The enamel is removed from the labial and lingual surfaces with flat mounted stones of suitable size. These stones should not only remove the enamel on these surfaces but also give the desired shape when the preparation was completed. Care should be used not to cut too deeply on the lingual surface. After the enamel has been removed, the shoulder on the mesial and distal sides can be defined with a thin three-quarter inch disk that runs perfectly true. By rotating the disk slightly to the labial and lingual, we can often extend the shoulder around the angles, simplifying the rest of the operation.

We have been cutting the shoulder too far under the gum on these surfaces in the past. On the labial and lingual surfaces, there is a shoulder outline, but not under the gum. With a 56 or 57 square-end plain fissure bur, the shoulder is squared on the labial and the lingual aspect. Care should be used not to undercut the tooth and that the bur lies as flat as possible on the tooth. If the bur is kept always at a right angle to the arc of the gum outline, the bur will hold its position on the tooth and not spin off into the tissues. An end cutting bur of the same diameter is used to reduce the shoulder about 0.75 mm. under the free margin of the gum on the labial side only. A small inverted cone stone or inverted cone finishing bur in the angle handpiece is used to smooth and also incline the shoulder on both the labial and the lingual aspect toward the axial walls; which adds strength to the restoration. The shoulder is now finished with end cutting files and chisels with a double cutting blade beveled at the proper angle to give the shoulder desired. The toilet of the preparation is completed with disks and strips lubricated with cocoa butter. Undercuts are filled in and incisal angles rounded. A transverse groove is cut across the incisal edge if there is a close or end-to-end bite.

The tooth stump is now prepared for the taking of the impression. The mouth is sprayed and the tooth is isolated by means of cotton rolls, dried carefully, painted with phenol, dried again with warm air, and covered with "copalax." The tooth is lubricated slightly before the impression is taken. Many cases of pulpitis may be traced to carelessness at this stage of the operation.

We are now ready to take the impression. We know that the greatest circumference of the prepared tooth is at the shoulder outline, and as we go rootwise, it gets smaller, this calling for greater care in taking the impression. The fitted cup with the compound is heated and carried to its proper position as indicated by the incisal guides. The impression is not chilled but is removed for inspection. Any excess compound is removed from the gingival periphery. If found to be satisfactory otherwise, it is replaced on the prepared tooth in its proper position. The cup is now heated with a round ended burnisher that has been heated.

The hot instrument is placed on the lingual aspect, then on the labial, and just enough pressure is applied with the finger on the incisal end of the cup to compress the compound tightly against the shoulder, but not enough to force the compound beyond. The impression is chilled with a cotton roll dipped in ice water and removed. A well compressed, clear cut shoulder should be the result.

It is very important that accurate working casts be produced on which to build the crown. A few minutes more at this stage of the operation may save considerable time and embarrassment.

The impression of the adjoining teeth into which the dye is to be incorporated is taken in either "denticol" or "true lastic."

Great care should be used in giving the proper protection to the prepared tooth while the permanent crown is being made. It should not irritate the tooth or the gingival tissues.

One method is to trim a celluloid form carefully to the gum outline and to perforate it at the mesial and distal incisal angles for the escape of air and excess cement. Before this crown is placed, the tooth is bathed with phenol, dried with warm air and varnished with "copalax." This is extremely important. The celluloid form is filled with silicate cement of the proper shade and then forced into the proper position on the tooth. The excess silicate is trimmed around the gingival margin. Before the cement hardens, it is slipped off part way two or three times. When completely hardened, it should be removed and set with a medicated cement.

In preparing the posterior teeth, I employ stones and the finishing instruments almost entirely. The finished occlusal surface should have the same general form as the tooth operated on.

We have been cutting vital teeth too extensively for the porcelain jacket restoration. Every care should be used to preserve the vitality of the dental pulp as well as for the proper protection of the gingival tissues.

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# A DEFINITE PLAN FOR DENTAL RESEARCH*

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SEPTEMBER 13, 1932, at Buffalo, N. Y., one of us (A. W.) presented to the Board of Trustees of the American Dental Association and to the Research Commission of the American Dental Association a brief argument entitled "The Need for Comprehensive Research into the Cause of Dental Caries,"[1] pointing out that the American Dental Association had up to that time expended more than $300,000 for research, much of which concerned problems related to the cause of dental caries; that, in addition to this, other research in the same field had been carried on either

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1. Walker, Alfred: J.A.D.A., 20:878 (May) 1933.

with or without subsidy from interested persons or organizations, and that the total expenditures in this country had reached a very respectable figure. The Commonwealth Fund and the Rockefeller Foundation were credited with recent grants.

It was noted that much of the laboratory work had not been correlated, and also the clinical observations had not been carefully recorded and filed, and that, in the main, the total number of clinical data and the laboratory evidence had not been assembled and correlated.

Reference was made to numerous investigators and their different findings and conclusions. The investigators had made their studies from the standpoint of the relationship of diet, racial and climatic influences as well as of environment. No serious effort to collaborate for the purpose of seeking out common factors upon which to base an analysis that would lead to definite clues concerning immunity or susceptibility to dental caries was evident.

The presentation of the argument referred to was prompted by the belief that if all of the available information was assembled in an orderly manner and carefully studied, it would serve as a basis for planning future research and that a well-prepared program properly presented would, in all probability, attract the attention of organizations interested in research, and that they might be persuaded to consider seriously the financing of such a program, thus relieving organized dentistry of a financial burden which it has so generously assumed but which should be borne by others.

In furtherance of this idea, it was suggested that a research director be engaged who would devote one or two years to a study of the literature and to work already done, and to the preparation of a program for future effort.

Studies which we have made recently have led to the preparation of a detailed plan, which is briefly outlined herewith.

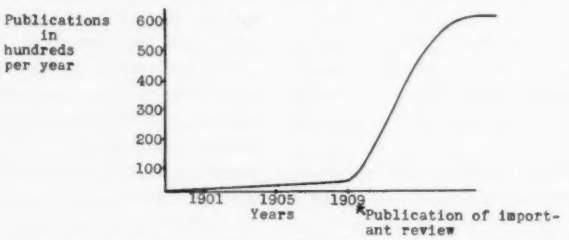


Fig. 1.—Increase in number of publications in field of physical chemistry in hundreds and for period indicated.

Hitherto, dental research has been general and uncoordinated and has not enjoyed the correlation that investigations in other fields have experienced. This is largely due to two facts: namely, the lack of a central station where such correlations can be made and, secondly, the absence of a comprehensive abstract journal or system such as chemistry has in "Chemical Abstracts"; medicine, in "Quarterly Cumulative Index Medicus" and biology, in the "Concilium Bibliographicum," and other departments have in special journals. In addition to these abstract journals, comprehensive reviews are made of important discoveries in the especial fields, such as the "Annual

Survey of Chemistry," the "Annual Review of Biochemistry" and "Recent Advances in Medicine." It has been the experience in physical chemistry, for example, that the publication of a comprehensive review of the subject marked the sudden increase in the number of publications of research in this field.

A graph representing such a rise is shown in Figure 1.

It is with a view of organizing dental research that the following program is suggested. Briefly, it involves the following points:

1. Establishment of a central bureau for organizing research.
2. Appointment of a director.
3. The setting up of a small group of members of the Association to act as advisors to the director, these men being known as trustees of research.
4. The setting up of a central library and repository where information may be had by investigators and where they may obtain advice concerning their problems, library facilities, models of apparatus, special operations, demonstrations of methods, etc.; similar to the central bureau of the American College of Surgeons, Chicago.
5. Provision for a board of advisors from the basic sciences, not necessarily dentists, but men of unquestioned status in their several lines capable of aiding the director in allocating funds for research, etc.

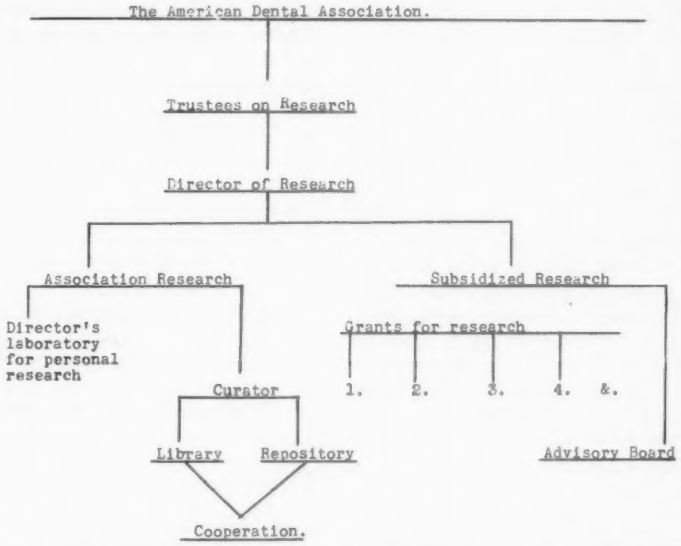


Fig. 2.—Proposed plan for administration of research under research director for American Dental Association.

The graph shown in Figure 2 may aid the reader to visualize the scheme contemplated in the foregoing provisions.

The following statements refer to the duties of the several officers provided in the scheme; also the central plant:

I. The central plant: This should consist of a small series of rooms in a central

locality, where accessories such as libraries, dental laboratories and supply houses are available. Geographic localization is less important than location where the best facilities are provided. The plant should have an office of the director of research, which will serve also for such meetings of committees and trustees of research as are held. Connected with this office should be a library and a repository, which could be expanded as demands arise. Quarters for an assistant to the director, who might be called the librarian or custodian or curator, should be made available. For a time, the repository would serve for this purpose. In addition, there should be equipped a private laboratory for the use of the director, in which he could carry on his personal research and such additional investigation as might be required. The library should be built up by donations of books, preferably dental journals in sets and reprints of publications on dental research. There should be no attempt to duplicate general libraries. Complete index cards with cross reference should be made of all reprints. To these cards would be added those from reports on investigations made by the director, to be mentioned later. In time, there would be a valuable reference library, the basis of an abstract journal, which could be published in a manner similar to those referred to in an earlier part of this paper. The librarian, or curator, would serve as secretary to the director of research and should receive adequate remuneration.

II. The director of research. This officer should be experienced in the larger field of research, interested and familiar with the problems of dental research, but not necessarily of dental education. Rather, he should be identified with investigations in the fundamental sciences, especially those approaching medicine. It would be his duty to correlate existing reports of dental research by comprehensive study and make the study ready for publication in some appropriate medium, preferably in the form of monographs. Thus, the problem of dental caries, being perhaps the most important one at present, should be thoroughly investigated and all reports of investigations in the several aspects (chemical, bacteriologic, anatomic, dental, environmental, geographic, comparative and social) should be considered according to their importance. In addition, the director should be in a position to aid investigators in search for literature on their respective subjects and, when necessary, personally advise the investigator regarding methods, equipment, etc. Again, the director would recommend to the trustees of research the allocation of funds for subsidizing research.

It is recommended that the regulations of the National Research Council for subsidizing research be adopted for dental research, as follows:

1. Grants will be made in order to cover such expenses as the following: apparatus, materials and supplies, technical assistance and field expenses.

2. In general, grants will not be given for personal salaries or fellowship stipends, for expenses of publication, for the purchase of books, for travel to attend scientific meetings or for research work of students under instruction.

3. Preference will ordinarily be given to the support of investigations (*a*) in which the problem and methods to be used are clearly stated and in which definite results can be expected with the aid of a grant; (*b*) toward which the university or other institution to which the applicant is attached also contributes financially or through special support; (*c*) for which a grant of not more than $1,000 is required.

4. A report of progress should be made by the grantee to the director of research at any time the latter may make the request and certainly within one year after the grant is put to use.

5. Quarterly reports of expenditures from grants are to be made.

6. The title to property purchased from grants will remain with the Association until ultimate disposal of the property is made by the Association on recommendation of the director of research through the trustees.

III. The trustees of research. The trustees should be three in number delegated by the Association to serve as liaison members between the director and the Association. They should be given liberal powers for executing the provisions made by the Association for research. They should have the power to recommend directly to the treasurer of the Association what moneys are to be drawn for expenses in keeping with the budget made by the Association. It is desirable that the term of election of the trustees be at least three years and preferably longer in order to maintain a given policy over a term of years. No stipend is attached to the trusteeship, but the usual expenses for stenographic and stationery needs should be met by the Association. These men would serve best if they were residents of some readily available geographic location, in order to avoid travel to and from the meetings.

IV. Association research. This would consist of two activities under the direction and participation of the director of research; namely, personal research, for which adequate laboratory facilities would have to be provided; for unless the director engaged in investigation, he would soon become, in the eyes of his colleagues, a passive member and lose that freshness and activity necessary for keeping abreast of the times scientifically; and secondly, the service of an assistant director or curator as custodian of library and repository materials. The clerical work of abstracting and preparation of monographs, etc., could be done by the custodian, until such time as the work became too heavy. The library and repository have been discussed above. Through the director's office, dentists and those in other sciences engaged in investigations relative to dentistry could obtain assistance, such as is given by the Surgeon General's Office and the Army Medical Museum, to medicine. Moreover, there would be a means of furnishing answers to questions such as the American Medical Association answers through its Council on Pharmacy and Chemistry. This is what we mean by "cooperation."

V. Subsidized research. Hitherto, this department has occupied the energies of the American Dental Association. Grants have been made in very liberal amounts to individuals and to institutions. We have called attention to the fact that the National Research Council is reluctant to grant funds of over $1,000 for any one investigation. This, as a matter of fact, is rarely exceeded. We add herewith a partial list of grants made by the American Medical Association Committee on Research for the year 1930:

| | |
|---|---|
| $ 600, | hormone research |
| 600, | antiseptics |
| 250, | sugar investigations |
| 250, | hormone research |
| 250, | blood chemistry |
| 200, | insulin |
| 125, | bone disease |
| 200, | medical chemistry |
| 200, | anesthesia |
| 200, | insulin |
| 75, | digitalis |
| 250, | blood |
| 100, | bacteriology |
| 1,445, | hayfever |
| 1,200, | parasitology |
| 140, | chemistry |
| 150, | stomach |
| 1,500, | parasitology |
| 1,000, | adrenal |
| 1,000, | toxicology |

Where grants were made in excess of

$1,000, the institution had had the work under way for several years and definite and important progress had been made. In 1930, the total expenditure for research was $13,200; for 1931, $12,000.

As to the kind of research needed by the Association, I quote from a paper by Dr. Lefcourt:

> There are two types of research necessary. One is in the field of repair and cure, the other in prevention. The profession has advanced readily on its reparative side and has been quick to determine methods to combat existing oral conditions. This field, mainly mechanical, has completely overshadowed the quantity of original work in prevention, the elimination of causative factors of dental abnormalities and pathologic processes.

That there is a large amount of published research throughout the whole range of scientific literature is well known. The question is: What has been done with it? Is it an available form? Has it been digested? Have funds applied to subsidized research been well allocated? This brings up the matter of the advisory board. It is contemplated that this board consist of about three members eminent in their line and actively engaged in productive work. It is not necessary that all be from the dental profession; in fact, it is desirable that at least two come from lines fundamental to dentistry as an art. Of the various dental schools, comparatively few are especially identified with research of a fundamental character. Few dentists outside the dental schools are engaged in research. The board should receive no remuneration, but its expenses should be met. It has no capacity other than that of aiding the director to recommend to the trustees proper assignment of grants; that is, it is purely advisory.

Mechanism of making grants: In order that it be clear just what rôle the various officers of the research divisions play, we shall take a given case. Dr. X, of the University of Missouri, requests $1,000 for an assistant to carry on bacteriologic studies under his direction leading toward an explanation of the change of oral flora under antisepsis. The application is received by the director of research, who studies it and calls on the advisory board for their opinion as to the merits of the case. The board requests information of the director of research as to what work has been subsidized, if any, by the Association in the past and to whom the grants were made and what the outcome was. The director's office finds that about $2,500 was spent over a period of seven years in subsidizing such research by three men in different parts of the country. The results of the three investigations have not been published, although the files show reports concerning the progress of the work. It is clear that the Association already has underwritten three investigations, and to extend the grants to a fourth applicant before the full results of the first researches has become available, the director recommends to the trustees for research that the application be held up for a while in order to determine what the prior workers have accomplished. Until lately, it had been evident that the fourth application involved practically a duplication of the approach made by one of the earlier investigators and this approach had been shown to be futile. The advisory board then suggests to Dr. X that he make a different line of attack and invites the director to recommend to the trustees that Dr. X be solicited to become an applicant for the grant for a smaller amount of money and to make a new approach. In this way, the duplication of funds, the assignment of a larger amount for a purpose already proved to be inadequate and saving of time are all controlled. This imaginary case is one

taken from an actual case in another science.

In order to show the manner of working of the monographic function of the director's office, we may take the following case: The director has compiled a monograph on that portion of the problem of dental caries concerned with the chemical constitution of affected teeth. This study is available to all dentists through the director's office. Dr. Y has opportunity to study the problem owing to the employment of a chemist for certain work in his office. The chemist is provided with the results of the research that has been made in this field and is enabled to proceed with an approach to the solution of the problem from an angle that has not been considered before this. Within a year, a valuable advance has been made in the knowledge of what happens chemically to affected teeth. The director's office has been the agent making this work possible, owing to the fact that it has all the data of work previously done, a piece of work which in itself the chemist would have taken several weeks or months to prepare and necessitating the expenditure of time and money in visiting libraries in distant cities.

Perhaps enough has been said to give the reader the idea that dental science can be advanced considerably, as other sciences are being advanced by controlled and correlated research, if aids are available for searching the literature and for preparing reviews of scientific literature, which would become available to all dentists.

Financial considerations: If the American Dental Association is immune from errors in making grants and in getting poor returns for its grants, it is unique in the societies making grants for research. The chemists and the physicians recognized the evil in uncontrolled subsidy of research and also in difficulties arising owing to the lack of means for becoming acquainted with the work of others. To mitigate this evil, the American Chemical Society started their "Chemical Abstracts" in a very modest way, somewhat as we are advocating that abstracts be made available for study of dental problems. Now, the single slender volume of "Abstracts" of twenty years ago has grown into four volumes per year each of 2,500 pages and covering about 30,000 separate investigations in all languages and in all parts of the world. Similarly, the Quarterly Cumulative Index Medicus absorbed the cumbersome Index Medicus, and all papers, whether important or unimportant in the realm of medicine, are cited each year. Medicine has yet to complete its program as the chemists have completed theirs; for aside from the relatively few abstracts given in such journals as that of the A.M.A., there is no place where the various articles can be studied save in the original journals. It is insufficient to have simply titles of research work; adequate abstracts of these reports should be made.

Dental monographs: We have referred to the preparation of monographs, or correlations of research on given topics. In other fields, such things are accomplished by "farming out" the various topics to capable men, and the compilations published in such journals as the *Chemical Reviews, Physiological Reviews, Annual Survey of Biochemistry* and many German and European periodicals. Ultimately, there must be a central clearing house for these compilations. Each of these journals has a highly paid staff of editors, but aside from editing the journal, no further need is served. In the scheme outlined above for dental investigations, we have provisions whereby not alone will compilations be made and published, but expert advice concerning investigations and literature will be avail-

able for any one desiring such assistance to enable them to add to dental science.

Dental research and medical research: Close correlation exists between these two divisions, but there is a lurking danger that this very relationship may leave untouched such problems as deal with what we may speak of as the mechanical aspects of dentistry. Sciences other than dentistry or medicine are continually making new discoveries of great interest to the practice of dentistry. Only sporadic attempts are made to interpret these discoveries to the dental profession at large. For example, it is our knowledge that a new flexible resin is about to be placed on the market which could be well adapted to making molds for the oral cavity superior to those made of the materials used at present. The material is clear and transparent. It may be applied in a flexible form and yet may be made to harden to an almost unbreakable mass. The report on this material will be made in one of the highly technical trade journals in chemistry, and it is rare for a dentist to look in such places for interesting developments; and if he did, the technical knowledge necessary for interpretation would be lacking. A man capable of becoming director of research for the Association must have the ability to delve in all lines and be alive to recent advances in the sciences and arts. Therefore, if the opinion prevail that medical abstracts and citations will serve the needs of the dentist, he misses many important matters that should be called to his attention.

Financial considerations: It is the history of all the successful developments in direction of research and in attempts to correlate knowledge in science that they began in small ways. In order to start the program outlined above, it would be necessary only to provide relatively modest quarters. The salary of the director should start at $5,000 and reach within five years a salary of from $8,000 to $10,000.

A man capable of directing such a department of the Association would be at a premium and snatched up by industry or the teaching profession, and the Association would always be in competition with other agencies. The salary mentioned is about that of the lower grades of professors in metropolitan teaching institutions.

In addition to the expenses of assistant or curator at $2,400, there should be a fund of $5,000 a year for carrying on the work of the department. It is doubtful that such a sum would be spent after organization once has been accomplished; but to insure a good start, $15,000 should be available for the first year. Thereafter, small charges would be made for advice, references, etc., and the department expenses would be perhaps reduced to $10,000 or less. The sale of monographs would be an item in the budget. Charges for photostatic copies of articles and photographs of apparatus, etc., should be made as they are made by other departments.

In this way, within a few years, the American Dental Association and dentists in general would have an enviable central station or clearing house. The savings that could be made in organizing grants for research would help defray the initial expenses of starting the project.

# THE INDIVIDUAL MISSING TOOTH: A FACTOR IN DENTAL AND PERIODONTAL DISEASE*

By ISADOR HIRSCHFELD, D.D.S., New York City

SINCE the underlying systemic or nutritional factors in caries and periodontal disease are still undetermined, our attention must obviously continue, for some time to come, to be focussed to no small degree on the local agencies which directly establish, localize or accentuate these maladies. Probably the most prolific factor is the individual missing tooth, yet the need for its replacement is frequently ignored by the patient or the dentist, or both.

In some instances, the patient is influenced by economic considerations. Less often, he is moved by an aversion to artificial restorations generally. Quite frequently, he is dissuaded by the dentist, who conscientiously believes that, by his advice, the patient's interest is best served, since the restoration might impinge on the adjacent teeth and threaten their integrity. Evidently, it is not realized that this would be less harmful than the almost inevitable disarrangement of one or both dental arches.

The young practitioner in particular is apt to give such advice, before he has learned, through mature observations, that the variety and amount of damage which may result directly or indirectly from failure to restore a missing tooth is unlimited. Yet not a few of the more experienced men still favor nonreplacement, especially of posterior teeth.

*Read before the Section on Periodontia at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

In a recent progressive clinic before a local organization, I stressed the importance of replacing a missing tooth as soon as possible. Much to my embarrassment, I learned from the audience that the clinician immediately preceding me had expressed the reverse opinion. He was probably unaware, through lack of observation in this direction, of both the far-reaching end-results of nonreplacement and the degree to which a pontic can be rendered practically innocuous through proper planning and construction, plus faithful observance of the laws of hygiene.

One must realize that although, through the various normal biologic or mechanical processes, the dental apparatus tends to be in a constant state of flux, its component units, the teeth, are retained in their lateral and axial alinement through the confining influence of their adjacent neighbors and of their occlusal opponents, the former preventing mesiodistal drifting, and the latter, elongation and, through the interlocking position of the cusps, buccolingual migration.

Obviously, therefore, every individual tooth, including that "dental stepchild," the third molar, may be said to be a keystone, not only for one, but also for both dental arches; for with the removal of any single tooth, the active forces that tend to disarrange the dental arches begin to operate, as shown in the accompanying table. For example, an unopposed upper posterior tooth is forced into buccal disalinement by the tongue, and a lower one

tends to be directed lingually, partly at least, by the cheek. The mesiodistal drifting of the teeth adjacent to the vacant space, soon followed by that of their neighbors, is caused mainly by the wedging action of food. The axial extrusion of unopposed teeth, is caused evidently by normal biologic forces within the osseous structure. Although, in certain persons, these changes in the dental apparatus are not soon apparent and are for a number of years comparatively innocuous, in the vast majority the vicious cycle begins to operate almost immediately after extraction of the tooth. Evidently, the disrupting forces are influ-

CONDITIONS THAT MAY RESULT FROM EXTRACTION OF AN INDIVIDUAL TOOTH

- 1. A break in contiguity of the dental arch
  - a. Drifting (mesiodistal or buccolingual)
    - Food impaction, entailing over 20 ill-effects, including caries and interproximal disease.
    - Traumatic occlusion
      - Periodontal disease, or accentuation of same
      - Cervical caries (?)
      - Pulp involvement
        - Acute or chronic inflammation
        - Referred pain
        - Devitalization
    - Root exposure
      - Cervical hypersensitiveness
      - Wasting (abrasion, erosion or cervico-abrasion)
      - Caries
    - Accentuation of depth of approximal gingival crevice
    - Interdental spacing
      - Excessive mobility
      - Traumatization of tongue
      - Unattractive appearance
      - Speech defect (social and economic disadvantages)
      - Traumatization of tongue (inviting malignancy)
    - Malposition of frenum labially instead of interproximally
      - Gingival recession
      - Accentuation of pyorrheal destruction
      - Interference with treatment
    - Approximation of jaws
      - Temporomandibular disturbances
      - Traumatic occlusion and
      - Gingival traumatization anteriorly
  - b. Torsion
    - Food impaction
    - Traumatic occlusion
  - c. Food impaction (other than that caused by drifting or torsion)
  - d. Root exposure (approximal)
    - Cervical hypersensitiveness
    - Cervical caries
  - e. Traumatization of tongue (inviting malignancy)
- 2. Elongation
  - a. Traumatic occlusion
  - b. Food impaction
  - c. Root exposure
  - d. Proximal bifurcation exposure (rendering prognosis of pyorrheal infection negative)
  - e. Drifting
  - f. Satisfactory restoration made difficult
- 3. Diminished function (Local)
  - a. Diminishing of periodontal circulation
    - Atrophy
    - Lowering of resistance to infection
  - b. Unhygienic condition
    - Gingivitis
    - Hypersensitiveness
    - Caries
  - c. Retardation of occlusal wear
  - d. Excessive occlusal wear on opposite side of mouth (inharmonious occlusal relation)

enced by the state of periodontal health and the degree of alveolar support (Figs. 1-3). Thus, in the presence of pyorrheal infection or considerable alveolar denudation, teeth drift quite rapidly, so that practically the entire masticating machine tends to turn easily from a comparatively static condition into one of flux and anarchy, with a kaleidoscopic disarrangement of both arches, which tends to accentuate the periodontal destruction or promote the establishment of disease at various other points near to, or remote from, the site of the "crime."

The end-results of nonreplacement of a missing tooth; namely, unesthetic appearance, dental caries, periodontal disease and possibly focal infection or other systemic sequelae, are identical with those that the parent and the dentist try to forestall by sending the child to the orthodontist; but, in the latter instance, the correction requires a great deal of time, effort and expense; while, in the former, prevention can be attained by the mere replacement of the lost unit. The above-mentioned complex changes in the masticatory apparatus have their inception mainly in three conditions, which are automatically created by the extraction: (1) loss of contiguity of the dental arch; (2) partial or complete loss of occlusal opposition, and (3) curtailment or complete cessation of local function, as indicated in the accompanying table.

Space does not permit of elaboration of

Fig. 1.—Case showing rapidity with which, even in mouth having apparently healthy periodontium, adjoining teeth may drift after an extraction. Above: Casts made prior to removal of upper first molar on account of caries. Below: Casts of same mouth made six months later. The upper second molar had migrated mesially to the degree indicated by the right vertical mark on the first molar in the casts above. The central vertical line indicates the additional distance traveled by it during the next six months; and the line to the left, its position eighteen months thereafter; which was about three years after the extraction of the first molar.

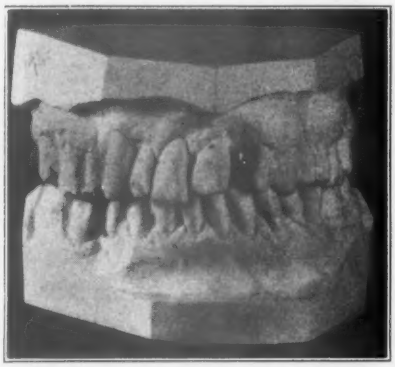

Fig. 2.—Extremely rapid drifting, hastened by marked pyorrheal destruction, of anterior teeth, after extraction of upper right first bicuspid. The casts show the complete closing up of the space within four months. The marked space between the upper left central and lateral incisors was produced within that short period by the drifting.

all of the foregoing causes and effects beyond their presentation in the accompanying charts, but the scope may be appreciated when we realize that one of these secondary causes alone, namely, food impaction, may give rise to at least twenty types of ill-effects.[1]

The extent of damage to the mouth as a whole which may be caused by failure to replace an individual missing tooth is best exemplified by the classic picture re-

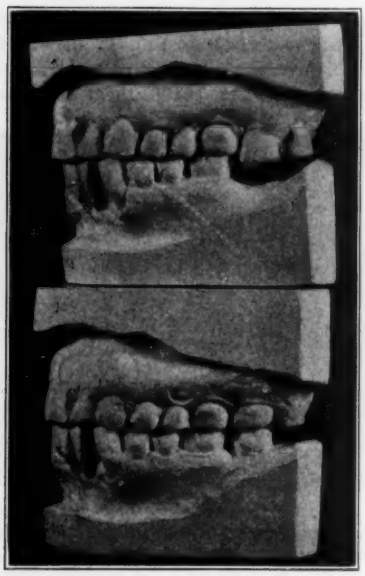

Fig. 3.—Case demonstrating rapidity with which teeth may elongate especially in presence of pyorrheal infection. The upper casts were made two years after the extraction of the lower second molar, which is still in position in the lower casts.

sulting from the nonreplacement of the lower first permanent molar (Figs. 4-5), in which instance approximately eighty abnormalities may be traced directly or indirectly to the extraction, as indicated in the following list of causes and effects. This number is considerably augmented when the additional pathologic end-results are taken into account.

1. Hirschfeld, Isador: Food Impaction, J.A.D.A., 17:1505-1506 (Aug.) 1930.

### CERTAIN CAUSES AND EFFECTS OF NONREPLACEMENT OF THE LOWER FIRST PERMANENT MOLAR

The loss of the lower first permanent molar is capable of producing the following kaleidoscopic changes, which loss of any other tooth in either arch may cause, though not to so great a degree (Fig. 6).

*Changes Due to Mesial Tilting of the Lower Second Molar.*—1. On its mesial

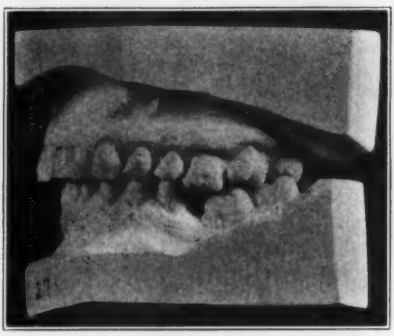

Fig. 4.—Casts showing classic kaleidoscopic changes, in both jaws, gradually produced by loss of lower first molar. Similar changes may be occasioned through the nonreplacement of any other posterior tooth. (Compare Fig. 6.)

side, the forward incline of the mesial surface invites an unhygienic condition and curtailment of masticatory gingival stimulation, with resultant marginal or hypertrophic gingivitis.

2. The lowering of the neck of the tooth tends to be followed by increase in depth of the gingival crevice and, often, resultant pyorrheal infection. The loss of mesial contiguity tends to excessive mesial leverage, alveolar destruction and deep pyorrheal pocket formation.

3. Distally, the elevated distal cusps act as accentuated "plungers," which tend to force food into the opposing interdental space, and cause inharmonious occlusion against the distal cusps of the upper first molar in protrusive excursions of the mandible.

4. The lowered mesial cusps of the mesially tilted third molar form an accentuated occlusal embrasure between it and the second molar, inviting food impaction, which is enhanced by the loss of contiguity mesially from the latter.

5. The food impaction results in pocket formation on the distal surface of the second molar; also root exposure, cervical hypersensitiveness and, finally, cervical caries; as a result of which cervical hypersensitiveness may be established and maintained on a coexisting buccal or lingual exposed root surface.

6. The marked tilting of the lower third molar invites elongation behind it of the upper third molar beyond the occlusal plane; which leads to food impaction between the upper second and third molars, not unlike that produced by the extraction of a lower third molar. This results in cervical caries on the mesial side of the third molar, and deep pocket formation on the distal side of the second molar.

7. The tilting mesially of both the upper and the lower second and third molars produces closer approximation of the jaws, which leads to a lowering of muscle tone and possibly resultant temporomandibular subluxation; also to occlusal strain on the anterior teeth and resultant periodontal lesions there, with loosening, protrusion and, consequently, interspacing of those teeth.

8. Occlusally, the lowering of the mesial cusps of the lower second molar deprives them of buccolingual interlocking with the upper first molar so that the former is rotated and inclined lingually and the latter is tilted buccally. The upper molar is also permitted to "elongate."

9. The increase in length of the clinical crown of the upper first molar and the shortening of its clinical root invite

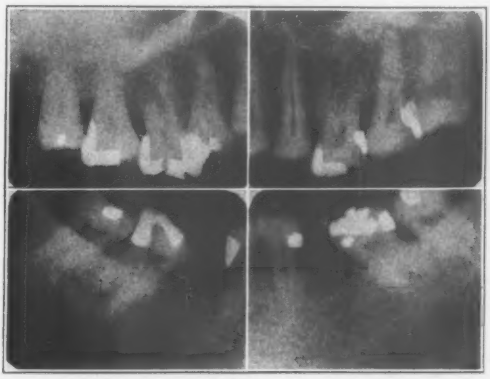

Fig. 5.—Both sides of case presented in Figure 4; showing mesial tilting of all second and third molars and elongation of the upper first ones. The proximal fillings, except those on the lower bicuspids, were necessitated by caries produced by food impaction due to the presence of enlarged occlusal funnels and close interdigitation of the plunger cusps that resulted from the drifting.

traumatogenic occlusion or leverage. Its elongation beyond the occlusal plane, too, tends to accentuate traumatogenic occlusion.

10. The lowering of its longest mesiodistal diameter and the resultant tilting of its neighbors lead to the deepening of occlusal embrasures and a dropping of distal cusps; which tend to food impaction and occlusal traumatization, respectively.

11. Food impaction so produced between the elongated first molar and its neighbors results in denudation of its approximal bifurcations; which leads to pyorrheal infection there, usually of negative prognosis, or to local accentuation of a generalized pyorrheal infection.

12. When an upper first molar so elongated and tilted buccally is used in mastication, the palatal root tends to become denuded, and, in the case of associated pyorrheal infection, its apex is reached comparatively early, with resultant involvement of the palatal pulp and its final devitalization.

The buccal tilting tends to accentuate food impaction and occlusal leverage. It also produces a sharp bend in the buccal alinement of the arch, which, in accentuated cases, tends to interfere with effective brushing of the teeth posterior to it.

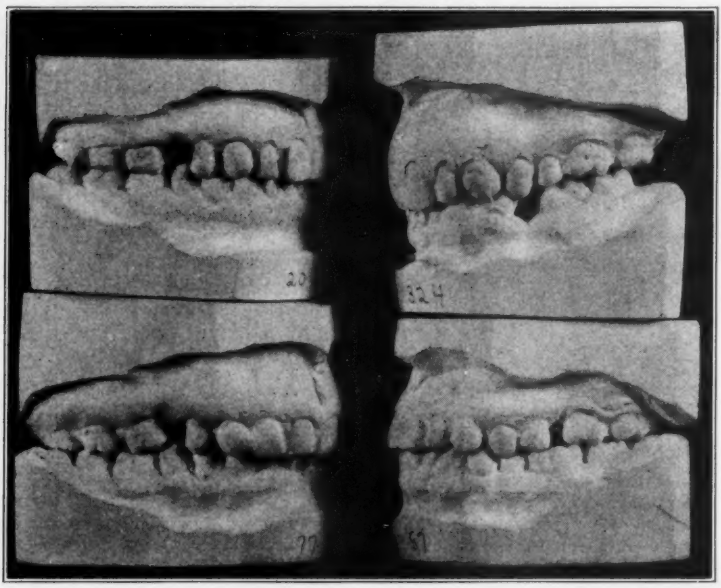

Fig. 6.—Cases showing extensive changes in both dental arches through extraction of individual teeth other than lower first molar. In Case 20, the elongated second bicuspid was eventually so severely traumatized against the upper right first bicuspid that pulp devitalization of the former tooth ensued, with resultant focal infection.

*Changes Due to Distal Drifting of the Lower Second Bicuspid.*—1. The usually associated torsion of the second bicuspid invites food impaction between it and the first bicuspid.

2. The distal drifting of the second bicuspid promotes a vertical intercuspal oc-

clusal relationship instead of interproximal interdigitation. This leads to occlusal traumatization and resultant periodontal disease, or depression of the opposing bicuspids, especially the upper, into the bone.

3. The distal drifting of the second bicuspid is often followed by drifting of all the teeth anterior to it, causing unesthetic interdental spacing, which invites lisping, traumatization of the tongue, strained functioning of the teeth individually and an increase (often deleterious) in the range of lateral mobility.

4. The lower central incisor of the other side, following the drifting teeth across the median line, is traumatized by the combined action of the mesial marginal ridges of both upper central incisors, and by its occlusal opposition by the two overwhelmingly large teeth. This leads to the establishment or, especially, the accentuation of periodontal disease, sometimes entailing pulp devitalization and resultant periapical disease. In a central incisor so malposed, the labial frenum is often attached to its labial gingiva, which either causes recession or accentuates gingivitis or pyorrheal infection and hinders their successful treatment.

A perusal of the foregoing list, tracing as it does, step by step, the development of the abnormalities and their pathologic sequelae in the wake of an extraction, may be of general scientific interest to the dentist. For convincing a skeptical patient of the advisability of early replacement of a missing dental unit, a demonstration of some of these, particularly the end-results, by means of casts, photographs, roentgenograms, etc., of actual cases, should prove of mutual benefit. (A

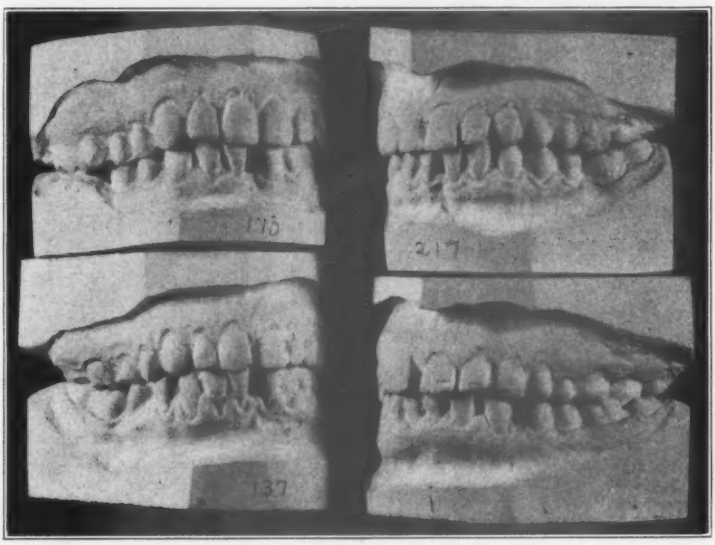

Fig. 7.—Typical cases illustrating general occlusal disharmony and presence of interdental spaces in anterior part of mouth, caused by the absence of individual teeth. In Casts 170 and 137, all the first molars were missing, with resultant space formation between the upper and the lower dentures.

miniature museum of such illustrative material can be utilized to great advantage in every practitioner's office.) One may find it of real advantage to stress, among others, the following items: (1) unesthetic appearance; (2) dental and periodontal disease; (3) temporomandibular disturbances; (4) tongue traumatization, and (5) difficulty in making satisfactory restorations, etc.

drifting of the anterior teeth, or through the spreading of the arch because of the excessive approximation of the jaws. The space, or spaces, so produced, though at first unnoticeable, may later become sufficiently marked to constitute a distinct social or economic disadvantage. Unlike the space resulting from the removal of an anterior tooth, into which, for obvious reasons, a pontic is generally inserted

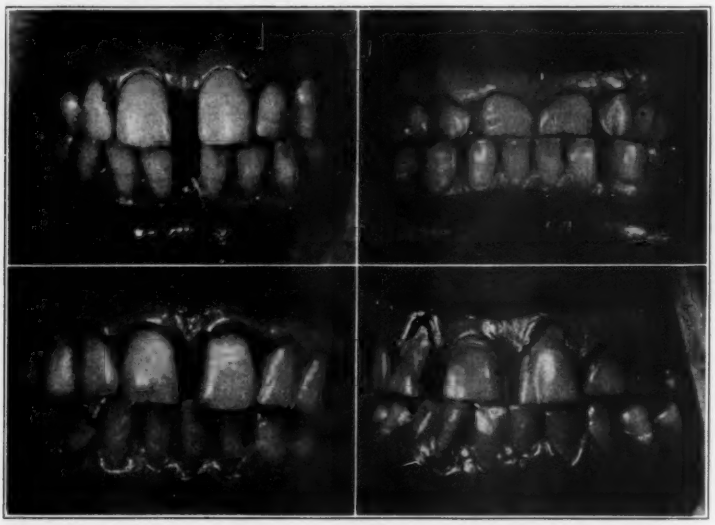

Fig. 8.—Above: Left: Large unsightly spaces between central incisors of both jaws, resulting from loss of all first molars and causing patient to lisp. Right: Space formation between central and lateral incisors in upper jaw and between lateral incisors and cuspids in lower, through the loss of all first molars. (In contrast to the case to the left, there are practically no central spaces.) Below: Left: Upper central space due to loss of upper molars only. Right: Case of girl, aged 17. There is marked space formation and pyorrheal infection accentuated by traumatic occlusion, due to drifting resulting from loss of an upper right first molar.

### UNESTHETIC APPEARANCE AND SPEECH DEFECT

Unesthetic interdental space formation in the anterior part of the mouth (Figs. 7, 8 and 18), often resulting in speech defect, may arise from the nonreplacement of one or more missing posterior teeth, either through the loss of contiguity of the arch, which invites distal

soon after the extraction, this space is usually too small to permit of a well-proportioned restoration. As a result, the "supernumerary" pontic is apt to be asymmetric, badly shaped and otherwise more or less conspicuous. Although orthodontic procedure to enlarge or to eliminate the space might be resorted to successfully, it is not always practical.

CARIES

Failure to replace a tooth extracted because of caries, periodontal disease or focal infection may itself lead to the establishment of similar disease conditions. Caries, for example, may be inaugurated, through lack of local hygienic measures, in an area deprived of masticatory function on account of the missing tooth. Again, it may result interproximally from food impaction (entailed by drifting caused by the extraction), which may be initiated not only in the immediate vicinity, but also in a more remote area, even in the opposing arch, as, for instance, in the region of an upper third molar which has elongated because of the mesial drifting of the lower second and third, after the removal of the lower first, molar; a result similar to that which obtains when a lower third molar has been extracted (Fig. 9). The elongation of the upper molar distally from, and beyond the occlusal plane of, the lower teeth, invites food impaction, which usually results not only in cervical caries on the mesial sides of the upper third molar, but also in deep pyorrheal pocket formation on the distal side of the second (Fig. 10).

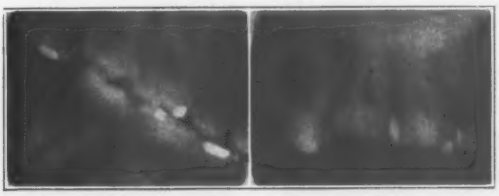

Fig. 10.—Case shown in Figure 9; typical combination of cervical caries in third molar, and deep pocket formation on distal side of second, produced by food impaction.

Fig. 9.—Classic picture of upper third molar elongated after removal of its opponent. A similar condition may be entailed by loss of a lower first molar and resultant drifting of the second and third molars mesially. This abnormality leads to food impaction between the upper second and third molars.

Fig. 11.—Mandible showing asymmetric occlusal effects of unilateral mastication frequently induced by loss of individual tooth. On the side used, the exposed occlusal dentin is sometimes so rapidly cupped out that the pulp is exposed and devitalized. The physiologic extrusion ("continuous eruption") of the worn teeth shortens the clinical root and exposes its cervical surface to caries. On the other side, the unused cusps interlock and so entail traumatic occlusal leverage.

PERIODONTAL DISEASE

Nonreplacement of a tooth may lead (mainly through resultant food impac-

tion or occlusal traumatization) not only to the establishment or accentuation of periodontal disease at points near to, or remote from, the site of extraction, but also to undue difficulty in its treatment, and even an unfavorable prognosis.

The various food impaction mechanisms based on extractions have been demonstrated in another paper.[2]

Occlusal traumatization may result from the nonreplacement in a number of ways: (1) elongation of the tooth opposite the point of extraction (Fig. 6); (2) the rise of the distal cusps of mesially tilted molars beyond the normal occlusal plane (Figs. 4-5); (3) limiting mastication habitually to the unimpaired side of the mouth with the result that the cusps of these teeth tend to wear flat rapidly while those on the other side retain their original normal form (Fig. 11); (4) excessive approximation of the jaws (resulting from the absence of one or more posterior teeth on either or both sides of the mouth), which produces occlusal strain on the periodontium of the anterior teeth. The strain is apt to become greater when steps have been worn into the palatal side of the upper teeth, or when any one of these is malposed in bite-to-bite occlusion (Fig. 12).

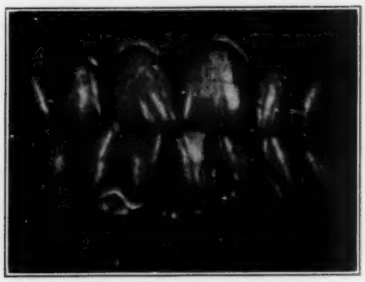

Fig. 12.—Acute gingival abscess resulting from mild osteomyelitis near lower left central incisor, the only tooth malposed in bite-to-bite occlusion. This tooth was severely traumatized when, through the loss of a posterior tooth, the jaws approximated each other excessively. Additional occlusal strain was incurred by the location of the tooth opposite both upper central incisors.

A clinical observation, not generally known, that demonstrates quite definitely the relationship between occlusal traumatization and the localization, or accentuation, of periodontal disease is the marked predisposition to periodontal disease of a lower central incisor when it stands opposite the median line of the upper arch. This malposition most often results from the drifting of teeth in either jaw as the result of absence of a posterior one in the respective arch. The periodontal condition here may be the sole macroscopic abnormality, but, if generalized, is apt to be more accentuated about this tooth, even to the point of negative prognosis, although the condition generally is only moderately advanced. In a recent presentation,[3] this fact was demonstrated by

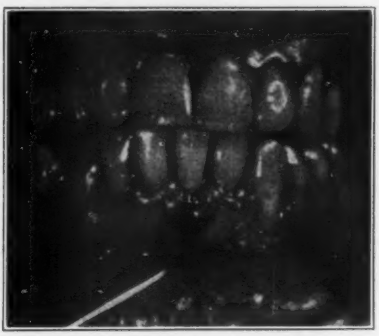

Fig. 13.—Unusually deep gingival cleft and hypertrophy, associated with pyorrhea, over lower incisor traumatized because of position opposite median line of upper arch.

2. Footnote 1, pp. 1504-1528.

3. Periodontal Ill-Effects Associated with the Lower Central Incisor's Malposition Opposite the Median Line of the Upper Dental Arch. unpublished data.

slides showing gingival recession, gingival clefts (Fig. 13), acute gingival abscesses, pyorrheal pocket formation and alveolar destruction (Fig. 14) about an incisor so malposed. Evidently, the extreme occlusal traumatization results partly from inequitable stresses between the single, smallest rooted mandibular tooth and the two, usually large rooted, maxillary incisors. This excessive strain on the lower tooth is markedly augmented by the close apposition of its incisal edge to the mesial marginal ridges of both upper teeth in

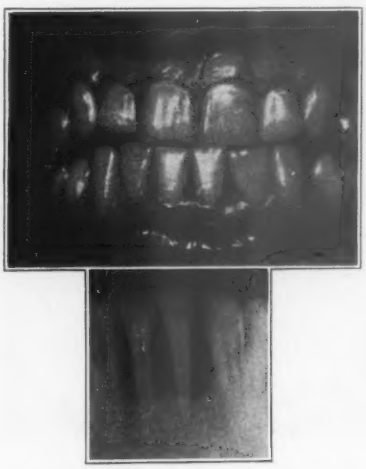

Fig. 14.—Pretreatment photograph and roentgenogram of case showing advanced pyorrheal destruction arising from lower left central incisor, which was traumatized because of its position opposite median line as result of drifting.

biting into a hard morsel of food (Fig. 15). Often, too, an incisor so situated wears off much more rapidly than its neighbors, and as it "erupts" proportionately out of its socket, it assumes still greater periodontal strain through the resultant shortening of the "clinical" root.

A lower central incisor that has drifted across the median line is frequently also subjected to the additional disadvantage of having the labial frenum situated labially from it instead of interproximally (Fig. 16), with the result that its pull tends to detach the gingiva and cause it to recede. When a pyorrheal pocket is present, the pull of the frenum may interfere with its healing to the extent that satisfactory results cannot be obtained until the frenum is cut away.

### ELONGATION OF THE UPPER FIRST MOLAR

Another instance in which the nonreplacement of a missing tooth often renders prognosis in a local pyorrheal condi-

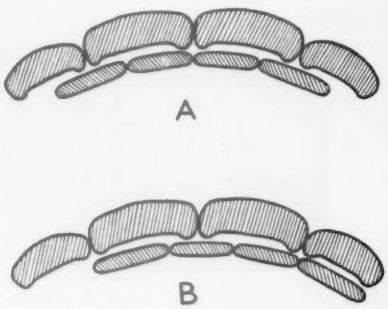


Fig. 15.—*A*, diagrammatic drawing (cross-section) showing normal relationship between upper and lower central incisors in centric occlusion. Because the upper and lower median lines are opposite each other, each lower incisor is opposed by the mesial marginal ridge of only one upper opponent. *B*, abnormal position of lower central incisor opposite upper median line. Its position opposite the marginal ridges of both upper central incisors brings it closer to these teeth than are its adjacent neighbors, and therefore it is subjected to much greater (usually injurious) occlusal strain during the excision of food, which acts as the traumatizing medium.

tion poor or even negative is that of the upper first molar which has elongated after the extraction of its opponent. Often, the resultant food impaction between the elongated tooth and the ad-

joining ones causes a pyorrheal infection, to which the now lowered bifurcations succumb readily, even in a mouth not generally susceptible to the disease; or, if a generalized, though incipient, pyorrheal condition exists, and the proximal bifurcations, because of the elongation, extend into the pyorrheal zone, it is almost a foregone conclusion that the tooth is doomed very early—a fact that, in every instance, is highly regrettable, for, except for the elongation, the tooth might have been restored to health.

Such elongation of an upper first molar may also produce the classic nonpathologic exposure of its palatal root,[4] an avoidable periodontal abnormality frequently diagnosed erroneously as of

Fig. 16.—Malposition of lower central incisor that drifted across medium line causing frenum to be located in front of it, instead of interproximally. As a result, the gingival flap is traumatized.

pathologic origin (Fig. 17). In the uncomplicated case, the gingiva, except for its recession, is normal in color, texture and contour, with no pocket formation. The frequent occurrence of this abnormality, often in apparently healthy mouths, has no doubt been a source of annoyance to many a practitioner. Yet its etiology, when uncomplicated by periodontal disease, may be clearly defined as periodontal resorption or atrophy, produced essentially by the mechanical forces exerted by the tongue and food in mastication, the extent of the denudation thus produced being proportionate to the degree of occlusal projection of the tooth and the angle at which it is tilted buccally.

As the tooth elongates, there is a tendency for both the buccal and palatal gingivae to elongate with it proportionately and thus retain their original cervical attachment. This happens only when mastication is habitually avoided in that area, as, for instance, when both the first and

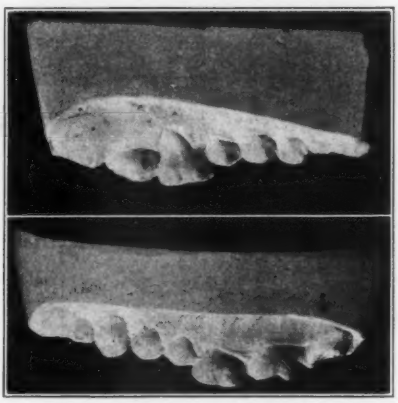

Fig. 17.—Above: Typical nonpathologic exposure of palatal root of upper first molar, elongated and buccally inclined, as result of nonreplacement of occlusal opponent. Below: Buccal side, showing tendency for periodontium there to elongate with tooth.

second lower molars are missing, or the unilateral mastication habit had already been established prior to the extraction, on account of the painful condition of the carious teeth. When but one tooth is missing and the patient resumes mastication on that side, the palatal gingiva often does not elongate with the tooth, notwithstanding the buccal tissue does, except

4. Hirschfeld, Isador: Some Types of Periodontoclasia, and Diagnosis of Their Incipient Symptoms, D. Items Int., 48:823 (Nov.) 1926.

when toothbrushing traumatization or an associated periodontal disease condition causes the denudation. The mechanics of the palatal root exposure may be explained as follows: With the elongation of the tooth, there is an associated tendency for it to be tilted buccally, the apices of the buccal roots acting more or less as a fulcrum. This tilting results from pressure by the tongue in mastication and deglutition, and is facilitated by the reduced buccolingual interlocking action of the mesially tilted lower second molar. As the upper tooth continues to elongate, the increased buccal tilting tends to place the already lowered obliquely flaring palatal root in a more nearly horizontal position. During the process of lowering and inclination of the root, the palatal tissues (which would, if permitted, grow down with the tooth, as above stated) are proportionately resorbed or atrophied by the pressure and traumatization to which the first molar area is especially subjected by virtue of its central location in the mastication zone. Therefore, the root is liable to be exposed in proportion to the extent that it has reached or, in extreme cases, descended beyond the general level of the surface of the palate.

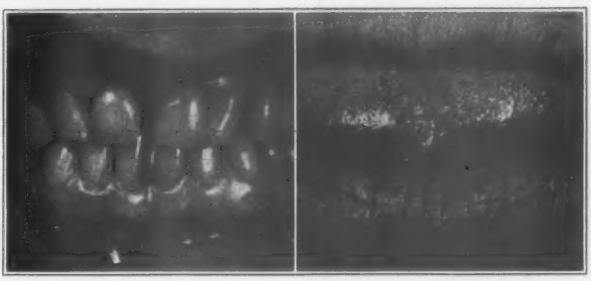

Fig. 18.—Left: Interdental spaces between central incisors caused by loss of all first molars in a woman, aged 48. As a result of habitual pressure of the tongue against the anterior teeth, when the patient was awake and during sleep, the tongue was caused to project into the spaces with ultimate formation of a semipedunculated extension that could reach beyond the labial plane of the teeth. Right: New growth on tongue. This was frequently traumatized by the sharp points and jagged edges of the upper and lower incisors, and thus malignancy was invited.*

### TEMPOROMANDIBULAR DISTURBANCES

Recent investigations have demonstrated that disturbances of the temporomandibular articulation and its associated structures are responsible for some of the vague pains, and complaints of other symptoms, in that region which have heretofore been explained as reactions from the gastro-intestinal tract, neurosis, the pneumatic sinuses and other traditional sites. It is claimed that certain cases which were unresponsive to previous therapy reacted favorably on the correction of the temporomandibular abnormality.

Some of the symptoms of a disturbed joint are (1) pain in chewing, (2) a cracking and snapping noise, (3) tinnitus aureus (a low buzzing type), (4) impaired hearing, (5) morning trismus, (6) limited and excessive condylar excursion and (7) eczema of the ear.

Sidney E. Riesner, of New York City, who has made a roentgenographic survey of the temporomandibular joint in a large

number of cases,[5] and has classified the normal anatomic relations of the articulation, in describing the effects on the temporomandibular joint of disturbances of the bite, states[6]:

Many traumatic reactions are manifest to the condyle head, the articular eminence and mandibular fossa, either individually or collectively, when this delicate balance of a functional unit is disturbed. It may result from a number of causes, but none is more poignant than the vicious sequelae of the loss of the first molar that has not been replaced. The drifting together of the approximating teeth through tipping, reduces the vertical height of the affected side and permits the condyle head to retreat deeper into the mandibular fossa. This results in a relaxation of the muscles that guide the condyle in the opening process, and thus permits unguided excursions which result in perforation of the articular disc, and sometimes its destruction; rupture of its attachment to the capsular ligament, causing the snapping, tripping action during opening of the jaw. The bone to bone relation of the condyle with the fossa causes deforming and destructive changes to either or both.

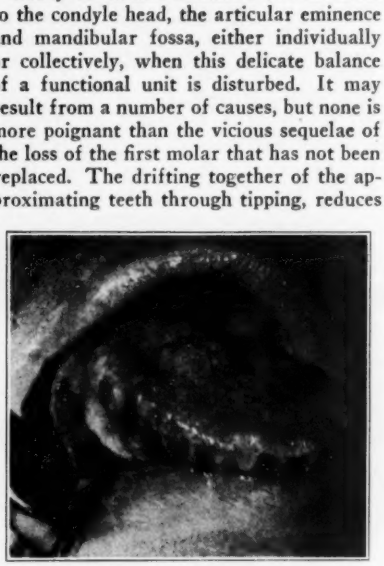

Fig. 19.—Malignant lesion on right side of tongue, located opposite sharp edge of lower second molar, against which tongue was traumatized because of absence of first molar. A similar condition may obtain in a mouth which presents no missing teeth, but in which there are rough edges or sharp points, especially in the presence of poor home care of the teeth and heavy smoking.

### TONGUE TRAUMATIZATION

I have seen a number of cases in which, through more or less continuous pressure into an interdental space in the anterior part of the arch produced by distal drifting, the tip of the tongue developed small sessile or pedunculated tumor-like masses which, in some instances, reached to the labial plane of the arch (Fig. 18). These are often traumatized by the teeth and thus exposed to possible malignancy. Instances have also been mentioned in the literature in which the lateral border of the tongue grows into the space left by the extraction of a lower molar and eventually becomes sufficiently prominent to be traumatized by biting during sleep when the patient lies on that side. Such repeated injury can undoubtedly result in malignancy. The patient shown in Figure 19 evidently presents a case in point. He was referred by his physician for the removal of the teeth adjacent to the space, with the object of eliminating the source of mechanical traumatization.

An outstanding specialist writes[7]:

The matter of tongue irritation brought about by reason of a missing tooth is one which I believe is well recognized in cancer circles amongst that group of men who are interested particularly with the problem of tongue cancer. I have referred to it directly or indirectly in many publications for a good many years past.

In this regard, it is important to quote from a recent communication by the ex-

5. Riesner, S. E.: Temporomandibular Articulation: Its Consideration in Orthodontic Diagnosis, Internat. J. Orthodontia, 22:1 (Jan.) 1936.

6. Riesner, S. E.: Personal communication to the author.

7. Quick, Douglas: Personal communication to the author.

ecutive secretary of the New York City Cancer Committee[8]:

**The opinion I have been given (by members of the Committee) is that if the teeth on either side of the space due to a missing tooth are smooth there is no reason to fear the development of cancer. It is generally agreed that jagged, rough, sharp teeth in a dirty mouth, plus heavy smoking, will lead to malignancy and that members of the dental profession should be urged to see that the teeth are kept smooth and in good repair and should impress the necessity for this on their patients.**

SUMMARY

1. The individual missing tooth is probably the most prolific source of local conditions that directly cause, localize or increase dental caries and periodontal disease.

2. Every individual tooth may be said to be a keystone, not only for one, but also for both, dental arches.

3. The complex kaleidoscopic changes in the masticatory apparatus following the loss of a tooth have their inception in three main conditions, automatically created by the extraction: (1) loss of contiguity of the dental arch, (2) partial or complete loss of occlusal opposition and (3) curtailment, or complete cessation, of local function.

4. A cause and effect chain of upward of eighty changes may result from the loss of a lower first permanent molar; but the loss of any other tooth in either arch may produce similar, if not quite so extensive, changes.

5. A miniature museum of illustrative material including casts, photographs and roentgenograms can be utilized to great advantage for demonstrating to the patient the unesthetic and unhealthy end-results of nonreplacement of a missing dental unit.

6. The loss of a lower first molar, like that of a lower third, is liable to result in cervical caries on the mesial side of the upper third molar and a deep pyorrheal pocket on the distal side of the upper second, as a result of food impaction caused by the elongation of the upper third molar, which has come to be unopposed through the mesial drifting of the lower teeth.

7. Unesthetic anterior interdental space formation, often resulting in a speech defect and sometimes in tongue traumatization, may result from nonreplacement of a posterior tooth.

8. A lower central incisor abnormally posed opposite the median line of the upper arch is predisposed to the establishment, or accentuation, of periodontal disease. Such malposition may result from drifting of anterior teeth following the extraction of a posterior one.

9. The elongation of an upper first molar following the loss of its occlusal opponent may lead to (1) extensive denudation of its palatal root and (2) the early exposure of its proximal bifurcations to incipient pyorrheal infection, thus rendering its prognosis negative, not withstanding the other teeth may be only slightly involved.

10. Disturbances of the temporomandibular articulation and its associated structures resulting from a missing tooth may be responsible for some of the vague pains and complaints of other symptoms in that region, which have heretofore been explained as reactions from a condition of the gastro-intestinal tract, the pneumatic sinuses or other traditional sites.

11. Through more or less continuous pressure of the tongue into an interdental space in the anterior part of the arch produced by distal drifting, its tip may develop small sessile or pedunculated tumor-like masses which, in some instances, extend to the labial plane of the arch. These are liable to be repeatedly traumatized and so exposed to malignancy.

8. Personal communication to the author.

12. In the posterior part of the mouth, the lateral border of the tongue may grow into a space left by the extraction of a lower molar to the extent that it eventually becomes sufficiently prominent to be readily traumatized, especially during sleep. Such continued irritation is often regarded as a possible source of malignancy.

730 Fifth Avenue.

# INCONSISTENCIES IN OPERATIVE DENTISTRY*

By JAMES MARK PRIME, D.D.Sc., F.A.C.D., Omaha, Nebr.

ADDISON said, "Inconsistency with ourselves is the greatest weakness of human nature."

Operative dentistry has its full share of these weaknesses—weaknesses that are illogical almost to the point of contradiction.

How painstakingly dentists boil their instruments, yet their hands, perhaps the greatest germ carriers in the dental office, get only a very brief washing.

Dentists would complain if they were asked to stand while they ate their meals. What would they say if they were unable to get a seat while riding in a Pullman? Almost without exception, I see them sitting; yet when it comes to doing one of the most difficult things performed by a man, i.e., filling teeth, they stand.

If there is any work human beings are called on to do requiring the limit of bodily endurance, of brain, muscle and nerve, it is dental operating. Do they stand because the barbers, from whom they inherited their profession, stood? If dental operators would sit, at least a major portion of their time, they would do their work better and would be able to practice much longer, and dental relief might be materially reduced.

Every dental operator surely recognizes the fact that oxyphosphate cement is not a permanent filling material, yet does not hesitate to use it freely in combination with gold. Then, too, it is used at the most vulnerable point of the filling, over the cavity walls, out to and including all the margins. It is permeable to the fluids of the mouth and soluble to an alarming degree.

This combination of cement and gold, known as the cast gold inlay, came into general use about thirty years ago. There are men today who contend that it is equal to the gold foil filling. On the other hand, there is an ever-increasing number who look on the inlay with much misgiving. This attitude is, in my opinion, destined to spread as long as cement is so unreliable. I venture the opinion that the cast gold inlay has reached, and passed, its pinnacle of popularity. Its decadence is everywhere in evidence.

Let me ask how many inlays that were made five or ten years ago you remove and find no evidence of failure. As for myself, it has become necessary for me to remove many inlays, some made by myself and some by others. Many of these inlays looked to be in good condition, but on removal, almost without exception, failure was either beginning or well advanced. This experience is borne out by other operators.

Could we ask for more convincing evi-

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 14, 1936.

dence than the everlasting loosening of cemented bridge abutments, which is often not discovered until the teeth are partly or completely destroyed by caries?

If cement is dependable, why be so concerned over a visible amount at a margin?

I am distressed when I think of these extensive reconstruction cases wherein each tooth is required to carry a cemented "restoration." Many of these teeth were, before they were cut, sound and noncarious.

The cemented inlay can never be considered as really permanent until we have a reliable cement, and that day would appear to be a long way off, to judge from the present product. It seems that chemical engineers must start out on an entirely new basis. New specifications must be set up. Perhaps the product would be a resinous-like substance. It must be insoluble and wear-resisting, nonirritating to the tissues, impervious to moisture and adhesive to a high degree, and must harden in from five to ten minutes. It must be capable of being mixed in a few minutes and have a fluid-like property that will permit the inlay to be completely seated.

Perhaps the cement problem will never be solved by the dental manufacturers. The need for a reliable material is so urgent that we would be justified in going elsewhere for it. It is said that the dental manufacturers have made no appreciable improvement in their material in fifty years of effort. The problem belongs to the dental profession, for the failures are laid at its doors. An interview with the chemical engineers of Du Pont, General Electric or the American Telephone & Telegraph Company might lead to a solution. For humanity's sake, something should be done.

The arguments in favor of gold foil, in selected cavities, over any other material, are commonplace and are universally admitted to be true. I shall therefore mention only a few. Admittedly, it is the filling supreme, nonvariable, the one causing no regrets. Where it is indicated, it is better than a cemented inlay in exactly the same proportion as gold surpasses cement in the fluids of the mouth.

No man should be urged to use gold foil unless he is prepared, in the use of instruments, in training and in experience, to do it. If he attempts it without these, he will fail.

No greater mistake can be made than to think a filling is good simply because it is made of foil. Of all fillings, a poor foil filling is the poorest. We have seen fillings made by inexperienced operators, wrong in cavity preparation and every other feature that goes to make a good operation. It is inconsistent to charge these failures to gold foil. The need for training along this line is a tremendous present-day necessity.

In my opinion, it is a mistake to advise the use of gold foil with hand pressure. The average man will fail completely. I have been a user of gold foil for many years and firmly believe there is no substitute for the mallet. The sooner dentists realize this, the more rapidly will the use of gold foil come back. It is inconsistent for dentists to attempt to get the required density and wall-adaptation with hand pressure.

For years, I have echoed the teaching of G. V. Black that the supreme test of a filling is its ability to maintain an unfailing margin.

These margins are made up of enamel rods on the tooth side and filling material on the other. To keep these in absolute proximity is the test of the filling. There must be more than contact at this point: there must be a pressure against these microscopic rods that will support and brace them against injury of whatever nature. You say that there is no margin in your inlay, but there is. It may look

perfect, as we see it with our poor vision; but, under a microscope, it looks like the Grand Canyon. There it is, big and wide enough to harbor millions of bacteria. Do you *look* at your instruments to "see" if they are sterile? Do you *look* at your razor blade to "see" if it is sharp?

With the cemented operation, we have cement to support the rods. Will cement bring a pressure against these invisible rods? Could it maintain a pressure if it did?

With amalgam, is there *pressure* against these rods—a sustained pressure—one that will support them when force is applied? If it had this marginal, rod-bracing, rod-pressing, rod-supporting, water-and-acid-excluding property, which, of all qualities in a filling material, ranks supreme, it would, barring color, very nearly approach the ideal.

The supreme test of all fillings is met nearly perfectly with gold foil, for these microscopic rods, be they long or short, are supported by a microscopic relation of gold to rods, from the force of the condenser—a sustained, continuous force, not possible, even in small degree, with any other material. Not only are these rods held perpetually by this gold, but condensed gold does more: it has the property of wearing evenly with the enamel, maintaining a water-tight, acid-tight, bacteria-tight, microscopic relation with these rods. When we understand this, we can know why these margins remain bright and perfect through the years.

With improved materials and technic, amalgam is unquestionably moving into second place as a cavity sealer and a tooth preserver. This would have been evidenced long ago had amalgam been given the study and attention it is receiving today.[1]

1. Black, G. V.: Operative Dentistry, Vol. 2, Chicago: Medico-Dental Co., 1908, pp. 167-168.

Of the three materials, gold foil, amalgam and the cast gold inlay, amalgam is the most difficult to handle. For years, it has been thought of as the easiest, and it is for just this reason that it has been held in such disrespect. From cavity preparation to the finished filling, there is no material requiring a more exacting technic. Operative dentistry will move forward in proportion as men devote their best efforts to gold foil and amalgam technic. Each is worthy of our greatest efforts. Each will reward the operator abundantly for time and labor spent. They are the only materials with which we may make a cement-free filling. With them, we are able to avoid the weakest link in the operative chain; namely, cement. Until we have a thoroughly dependable cement, the reputation of the man who depends on cement is hanging on a slender thread, as is the well-being of his patients.

I would not have you think we must abandon the restoration in which cement is employed. Modern dentistry demands it. Poor as it is, we are compelled to use cement in combination with both gold and porcelain in bridgework. Nor could we think of going back to filling big, deep cavities in bicuspids and molars with gold foil. Poor as cements are, both oxyphosphate and silicious, we must use them, and this is why the cry everywhere goes up for a dependable material.

Of all the inconsistencies in operative procedures, I know of none that surpasses the habit of filling badly infected cavities. I have observed men so careful of their amalgam that they would not allow it to come in contact with their hands; yet they would take this same material and pack it into a saliva-infected cavity. I have seen them do no more than wipe out the excess saliva with cotton and proceed to fill the cavity. They seem to ignore the fact that the presence of bacteria was the cause of the original cav-

ity. This, bad as it is, is not half the story. All carious tissue has been removed from few carious cavities that are filled. G. V. Black says: "This carious mass contains a poisonous substance elaborated during the carious process, which, when shut up in this way, especially endangers the vitality of the pulp. This is the principal reason why we find so many dead pulps under such fillings."[2] It is inconsistent for dentists to attempt to cure carious cavities and seal millions of germs under their fillings.

When will operators learn that caries cannot be successfully removed from a wet wall? An operation can be successful only when all the caries has either been removed or sterilized with a proven, dependable agent. How long will it be before the dentist recognizes this fundamental fact, a fact upon which his operations must stand or fall? Caries cannot be successfully removed from a moist wall, and grindings from the bur cannot be completely washed or scraped from a wet wall. The operator proceeds by sinking a bur into the cavity, attempting to wash the grindings out with a flush of water, which, in turn, the patient spits out. This style of operating surely is a friendly gesture for the bacteria. The dentist not only leaves billions in the cavity walls; he does more: he prepares quantities of "bone meal" finely ground for their consumption. Bone meal is famous as a plant food, and since bacteria belong to the vegetable kingdom, how cleverly this man feeds his little unicellular plants. With warmth of body temperature, all else they need is food and drink, and such an operator makes the picture complete. It is difficult enough to get this "meal" out of a dry cavity with a strong blast of air; it is impossible to remove it from a wet wall. If an operator refuses to use the dam and persists in working in wet cavities, he would greatly improve the walls by flushing with the spray bottle containing a 50-50 solution of hydrogen peroxide and water, wiping out the cavity with pure hydrogen peroxide and drying it with chloroform. This in no wise gives results comparable to those obtainable by the use of the dam.

Not only is the gold foil filling the peer of all, but also with it the operator must use the rubber dam. I consider this fact one of the cardinal virtues of this filling. The use of gold foil not only lifts him to the highest place in the operative field, but it also makes the application of the rubber dam a daily routine measure, and he will use it for all other materials.

Starting the daily use of the rubber dam is the beginning of wisdom. When the rubber dam comes through the door, slipshod methods go out of the window. It marks the beginning of better dentistry. It is the first step in that long ascent to bigger and better things. Each day will see him laying aside the ordinary, and embracing the extraordinary. Those patients seeking the extraordinary will find him.

The only thing that permits the man not using gold foil and the rubber dam to continue in practice is the fact that the public does not know what you and I know about the rubber dam, the rôle it plays in operative procedures. If the public knew, every office would be sought out by people desiring a high grade operative service. It could, in a measure, mean the passing of what we see every day: failing amalgam fillings, especially in the occlusal surfaces of bicuspids and molars. A bur would no longer drop into a mass of soft caries as it passes through amalgam.

Methods for doing technical things in dentistry differ widely. One may be as good as another. A difference in technic may mean no difference in results. A difference in opinion on these things is

2. Footnote 1, Vol. 1, p. 206.

wholesome, for differences may lead to improvements. This does not apply to the use of the rubber dam. In all the years since the rubber dam was introduced, there have arisen many substitutes, but not one has enabled the operator to keep teeth continuously dry for so long a period as is required to prepare a good cavity and make a filling even though it be a simple one of amalgam. To modern operative procedures, the rubber dam is simply indispensable, and arguments against its use by any man stamps his operative work in a class with his argument. Occasionally, conditions are encountered wherein its application is impossible. When I meet such a condition, and I cannot use the dam, I finish the operation with the thought that if I had to work continuously under such conditions, I would close my office or specialize in some other branch.

How long will a scientifically trained profession recognize a filthy habit as anything short of malpractice? A high school graduate would know it is a violation of surgical laws, would know it is a violation of ordinary kitchen cleanliness. If a long-suffering public only knew of the hordes of living microbes being daily locked under fillings, to be evidenced later in recurrent caries, pulpitis or focal infection, it might make a difference in the number of people visiting the offices guilty of such carelessness.

I have thought for years that the word easy should have no place in the dentist's vocabulary, but I can see one place where it may be used. In the ordinary run of cases, the rubber dam is easy to apply. You say, "The patient objects to the rubber dam." In some cases, yes, but does he like the bur, or the polishing disks, or strips, or the scalers, or the hypodermic needle, or the chisels, or the forceps or anything else in your cabinet? Can we practice dentistry and use only what the patient likes?

Here are enumerated fifty-seven reasons for using the rubber dam. It: 1. Affords a nearly surgically clean cavity. 2. Reduces pain. 3. Affords a better view of cavity. 4. Dams back the saliva. 5. Reveals the true condition of tissues to be excavated. 6. Reveals decay at the dentino-enamel junction. 7. Protects the patient from infection from unclean instruments; 8. Protects the patient from infection from the operator's hands. 9. Protects the operator from infection from the patient. 10. Protects the patient from aspirating foreign bodies. 11. Protects the patient from inhaling powdered tooth substance blown from the cavity. 12. Prevents the patient from swallowing foreign bodies. 13. Prevents the patient from wasting the dentists's time by talking. 14. Holds septal and gingival tissues out of operative field. 15. Protects lips, tongue and buccal tissues from revolving instruments. 16. Acts as a tongue depressor. 17. Acts as a cheek retractor. 18. Protects the tongue against disagreeable tasting drugs. 19. Permits more thorough examination of proximal surfaces for beginning caries. 20. Reveals subgingival accretions, which may be more readily removed with open view. 21. Reveals shadows emanating from decay beneath fillings. 22. Affords a dry, clean wall, offering a better surface for the attachment of cement. 23. Protects cements, both silicious and oxyphosphate, from moisture during the initial set. 24. Assures dryness. (The débris from cutting cannot be successfully removed if it is plastered to walls by moisture. A thorough toilet of the cavity requires dryness.) 25. Assures good gold foil work. 26. Assures dryness of tissues, promoting absorption of local obtunding agents. 27. Assures dryness necessary for thorough absorption of sterilizing agents such as silver nitrate. 28. Protects oral tissues from injurious drugs. 29. Aids greatly in determining the proximity of pulp horns.

30. Is very necessary for pulp capping. 31. Is imperative for pulp extirpation. 32. Is imperative for root canal therapy and filling. 33. Assures successful examination of occlusal surfaces for developmental faults. 34. Assures better amalgam operations, as moisture cannot be incorporated in the amalgam, and pieces are not scattered over the mouth. 35. Because of greater efficiency, saves operator's time. 36. For the same reason, saves the patient's time. 37. Increases the operator's income through greater efficiency, and is therefore favorable economically. 38. In single inlays and inlays for bridge abutments, allows enough time to disk all accessible margins before the cement sets. 39. Assures more successful placement of cement bases under fillings when the dam is applied. 40. Assures more successful testing for vitality with the faradic current of teeth isolated with dam. 41. Assures more advantageous removal of silicious cement fillings. 42. More definitely reveals etching of enamel, hence, aids in extension for prevention. 43. Improves contact points making for better mouth health. (If proximal fillings present rough and ragged contacts, so the ligature cannot be passed, these need shaping and polishing.) 44. Tends to raise professional standing of operator. (A discriminating public is learning that good operations cannot be made in a saliva-contaminated field.) 45. Makes for a better preparation for a jacket crown. 46. Assures more accurate cementing of jacket crowns. 47. Makes for a better impression for a porcelain inlay. 48. Assures more accurate adaptation of platinum matrices. 49. Assures more accurate setting of porcelain inlays. 50. Makes for more satisfactory examination of the margins of fillings of all kinds for possible faults. 51. Helps in determining the fit of a newly made cast inlay. 52. Helps in determining the accuracy of cavity walls, so necessary for the cast gold inlay. 53. Makes for more accurate wax patterns. 54. In temporary fillings, prevents contamination of cavity. 55. Promotes the confidence of the physician, who, realizing the value of asepsis, should refer patients to the operator who habitually uses the dam. 56. Assures more minute observation of enamel faults such as checking, hypoplasia and mottled spots. 57. Is logical. To disregard the value of the dam is to ignore what we know about accepted surgical procedures; to throw away the knowledge gained from the microscope and fly directly in the face of the germ theory of disease.

Another inconsistency lies in the recent discussion of pit and fissure cavities. From what has been written, we might conclude that most teeth are lost from this type of decay, when, as a matter of fact, to judge from my observation, proximal decay is a commoner cause of the loss of teeth. This discussion has served an excellent purpose in developing in the profession a keener appreciation of occlusal faults and the necessity for early treatment. For this, we have Dr. Hyatt to thank.

Every pit and fissure should be filled just as soon as the tooth gets through the gum tissue. But here is the rub: The dam cannot be applied. What will be the result in the average man's hands? That is the real question. Instead of a short fissure line, the line will be changed to a long one—much longer—running entirely around the carelessly placed metal. It will be overfilled, and soon the edges of the amalgam will be chipped off and a new "fissure" much longer will be created. It appears to grow out of the cavity and unless frequently "manicured," it may soon be in as bad condition as when the gesture at filling was made. Then, if there were caries present (and there usually is), enough is left to assure a recurrence, and because the filling hides the true condition and prevents the explorer

from passing into the depth of the carious area, it is neglected until the tooth may be destroyed. This procedure could well be likened to an incomplete operation in a malignancy. The operation slows the process, but results in scattering it.

Too many pages have been written on "What Is a Fissure?" and not enough on how it shall be filled. In other words, it matters little what we call it, a fault, a fissure or a failure. It all amounts to the same. Its name, like that of a race horse, means nothing, but how fast the horse can run means much, and how the fissure shall be filled means everything.

At one time, I opposed filling these fissures before they become carious. I do not do so any more. I reasoned in this way: If we are justified in cutting into sound occlusal enamel, to prevent decay, why not cut into sound enamel on the proximal surfaces, where a more dangerous type of caries develops? I have decided more harm can come in waiting than could possibly occur in filling some that might never decay. Then, too, all things being equal, there is less tendency to recurrence where no active caries was present. I certainly think that careless filling of a precarious fissure might result in making the condition but little better than if no filling were made. I would be happy in the thought that any man could do the work well enough to justify his attempting it. My thirty-six years of practice has taught me that the ordinary dental operator could, but will not, do it. Knowing that so well, I subscribe with reservation to the dictum "If the explorer sticks, open and fill."

I would say "If the explorer sticks, apply the dam." Now, and not before, can the real condition be studied. In most of the cases presented, the teeth are sufficiently erupted to admit the application of the dam. "No tooth crown is really examined until it is dried under the dam." And only under such conditions can it be successfully filled. So what may we expect of a man who uses neither the binocular loupes nor the rubber dam? How much better off will the patient be if he opens the fissures and fills it and allows the patient to believe his teeth have been successfully cared for?

"Open and fill, and the tooth will be saved" sounds easy, but you and I know that it is not so easy as it sounds. "Open and fill" may mean little more in saving the tooth than lathering may mean in shaving.

I would be interested in seeing a group of these cases that were handled by average operators, five and ten years ago; that is, provided the fillings were there to observe.

You may recall my advocating the practice of attempting the immunization of these occlusal surfaces by rounding out the precarious faults with burs, stones and disks. After practicing it for years and observing the results, I gave it up as a mistake. Try as I would to avoid it, caries frequently recurred in the bottom of the polished groove. Then, too, it took more time than to apply the dam and make a filling. I still use it in conjunction with fillings. In finishing, occasionally shallow faults and little tubercles may be polished out rather than included in the cavity outline. Dr. Black, in his revised "Operative Dentistry," has enlarged "extension for prevention" to include all occlusal faults.

We frequently see freshly made fillings that are beautiful to look at. We should not be so much interested in the new shiny fillings as in the ones that have been in the mouth from ten to twenty years and still look new and unchanged by time.

The occlusal faults are a very dangerous type of dental caries because the caries occurs beneath the surface of the enamel and is hidden until the enamel is undermined and perhaps the pulp is involved.

This type has been held up as the most dangerous because it is difficult to find and its incidence is greatest. I wonder if this is true. I believe that proximal caries is the more dangerous type. My reasons for this belief are based upon the following facts:

Proximal caries begins on the enamel surface between the teeth and is completely hidden to the patient and the dentist in its early stages. It is practically impossible for the dentist to find these cavities unless he resorts to the bitewing film, while he needs no film to locate occlusal caries.

Proximal caries in one tooth is almost sure to involve the proximal surface of the approximating tooth, while an occlusal cavity involves no other tooth.

When a proximal surface is lost from caries, the contact with its neighbor is lost and tooth movement is begun, setting up a malrelation of the occlusal surfaces; while no tooth movement occurs, nor are any contacts lost, from a simple occlusal cavity.

When the proximal surfaces are lost from caries, food packs between the teeth; which destroys the septal tissues and bone septums, either of which is irreparable; while an occlusal cavity foreshadows no immediate danger to these tissues.

There are but twenty occlusal surfaces in a full complement of teeth, while there are sixty-four proximal surfaces.

Proximal cavities are more difficult to fill than occlusal cavities because they involve a proximogingival margin, which, both in cavity preparation and finishing filling, offers a difficult problem.

Because of the difficulties encountered in restoring lost proximal surfaces, such as separating teeth, inaccessibility, building proximal forms, contact points, longer cavity outline and involvement of many surfaces and numerous walls, the chances for failure are greatly increased with eventual loss of the teeth.

To my knowledge, there has been no thorough survey to determine the relative incidence of proximal and occlusal caries; nor is it possible, for thousands of etchings on proximal surfaces (which are the beginning of the cavity) cannot be found by explorer, mouth lamp or even the roentgenogram.

I have been conducting a study for the past six years on proximal surfaces of the upper six anterior teeth. I have examined more than 1,000 teeth and I have found but five persons whose upper front teeth were free from caries. Exception, of course, is made of those patients whose upper front teeth were not in proximal contact. Our trouble has been that we have not counted or considered a surface as carious unless there was a visible cavity. Caries is caries from the very first etching up to the loss of the tooth. I have concluded that proximal caries of the upper six anterior teeth is well-nigh universal. I have no reason to doubt that the same condition exists in the bicuspids and molars, although it is not so easily demonstrated.

Practically every dentist doing operative work has patients in the chair every day whose upper front teeth have, or have had, proximal caries. Only the well-advanced cases are noticed. There is a fate awaiting these little etchings but little short of a tragedy, for each will probably go unfilled or carry a failing silicious cement filling.

Is it not a serious situation when dentists will not concern themselves in so important a part of their work? They are not interested in a method to disclose these beginning carious spots, which, in the early months or years of the disease, are invisible.

If the method that I described in 1935[3] did nothing more than disclose these invisible etchings, it would be a great boon

3. Prime, J. M.: D. Cosmos, 77:1046 (Nov.) 1935.

to humanity. Happily, it does more: it will, if applied often enough, immunize them.

Let us presume that the figures for the occlusal faults and caries incidence are correct. It could not be compared with the incidence of proximal caries because the latter is unknown, and a known quantity cannot be compared to an unknown quantity.

I contend, therefore, that the proximal caries incidence is greater than the occlusal caries; that proximal caries is more difficult to find than occlusal; that, because proximal caries involves more tissues and is more difficult to manage, it is a more dangerous type and should be so treated in the literature.[4]

There are two important angles to this matter of chemical immunization which I have repeatedly brought to the attention of the profession: 1. The method outlined is the only method yet suggested to disclose these beginning carious spots. 2. After using it for over six years, I am convinced it not only will disclose them, but also will, if applied often enough, immunize them. This I have stated before, and practically no response has come from the profession. I have asked the Research Commission of the American Dental Association to interest itself. So far, no response. It is manifestly up to the American Dental Association to accept it or prove by careful research that it will not do what I have claimed.

How long will we stand by and permit the teeth of our youth to decay, especially the upper front teeth, particularly when we know we have no satisfactory material with which to fill them?

How long will we interest ourselves more in the prevention of pain in cavity preparation than in prevention of the cavity?

How much longer will dentists wait for the cavity to get "big enough to fill"? which is comparable to waiting for the house to get half burned down before you call the fire department.

How long will we have "prophylactic odontotomy" for the occlusal faults and overlook a method of "prophylactic odontotomy" for the more dangerous proximal caries, and without the use of a bur?

How long will dentists fail to recognize the fact that, in a tooth filling, we are dealing macroscopically with a microscopic problem? We *look* at tissue, and at a margin, as if we could *see* them. When we do this, we make our intellects just as blind as our eyes.

How long must we stand by and see nine out of ten operators trying to perform operations in vital teeth without the rubber dam? The colleges, as well as the profession, do nothing about it.

How long must we see the few who do use the rubber dam tie a silk ligature around the teeth, doing irreparable injury to the gingivae?

How long will dentists be more interested in a clinic for replacing a tooth than they are in one for saving a tooth?

How long will we persist in keeping from the public the fact that there is a method for filling their children's teeth with gold foil while the children are in their teens, and which will, if properly done, last practically a lifetime?

How long will dentists fill a cavity with cement and call it temporary—camouflage it by pressing a gold casting into it and call it permanent?

How long will we permit the public to be deceived by such glaring deceptions as "synthetic porcelain," "filling porcelain," "enamel fillings," and "porcelain," when any schoolboy knows they are only cement?

How long will dentists continue to remove deep caries, and by so doing expose pulps; when, in most cases, the hard portion of this infected tissue may be sterilized by a proven method and safely left?

4. Footnote 1, p. 208.

How long will it take dentists to realize that the inlay problem is not all in the "fit," but as much in the "set"? for, after all, it is only as good as the cement with which it is set.

How long will the profession fail to recognize the fact that healthy gums will no more bleed when they are brushed or massaged than will healthy fingers or hands when they are washed or massaged?

How long must we wait for operative dentistry to take its deserved place as dentistry's greatest service to humanity, first in our dental colleges, first in our journals, first in our dental meetings, and last, but not least, first in our offices?

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# USE OF ROENTGEN RAYS IN THE PRACTICE OF CHILDREN'S DENTISTRY*

By HENRY CLINE FIXOTT, D.M.D., F.A.C.D., Portland, Ore.

THE civilized peoples of the world are living in an age of rapid change and development. The physical and mental strain of keeping up with the procession has brought to the human family many disabilities in the way of shattered nerves and diseased bodies and minds, and has placed corresponding responsibilities on the medical and dental professions.

Fortunately, our knowledge of the cause of ill health has in a measure kept pace with the increased demands on us, and we are better qualified today to treat —yes, to prevent—disease than ever before.

At the present time, there is probably no other disease affecting the human race that is so prevalent and so fraught with danger as dental caries. Each succeeding generation seems to be more affected with this disease than the last.

The first step in the prevention of dental disease is a thorough examination of the oral structures followed by a diagnosis. The use of the roentgen rays as an aid in diagnosis is indispensable.

Of primary importance for prevention in the whole field of dentistry is the care of children's teeth and the education of the child in the value of oral health and cleanliness and methods of keeping the mouth and teeth clean.

It is important because when we have taught the children of today how to care for their teeth and why they should do so, the adults of tomorrow will be better cared for and better equipped dentally than the adult of today, and many of the ills that are the result of dental disease will be done away with.

In the light of present-day knowledge, we are aware of the fact that crooked deciduous teeth cannot be replaced by straight strong permanent teeth, that caries in deciduous teeth must be corrected to avoid serious future trouble and disease and that a periodic thorough examination of children's teeth, followed by a diagnosis of the condition found, must be made if we are to prevent abnormal and degenerative dental conditions from pro-

*Read before the Section on Children's Dentistry and Oral Hygiene at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

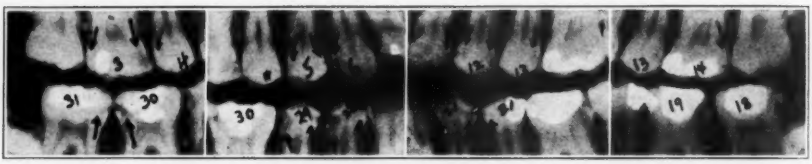


Fig. 1.—Bitewing films made in examination for caries and interproximal conditions.

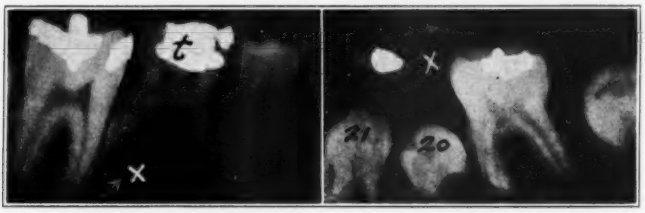


Fig. 2.—Left, congenital absence of second bicuspid. Right, premature loss of second deciduous molar causing loss of space for erupting bicuspids.

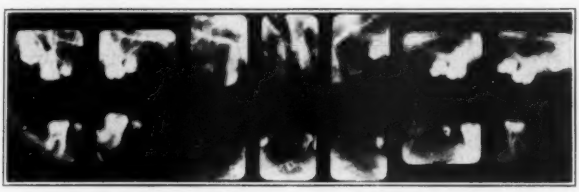


Fig. 3.—Congenital absence of twenty-two permanent teeth.

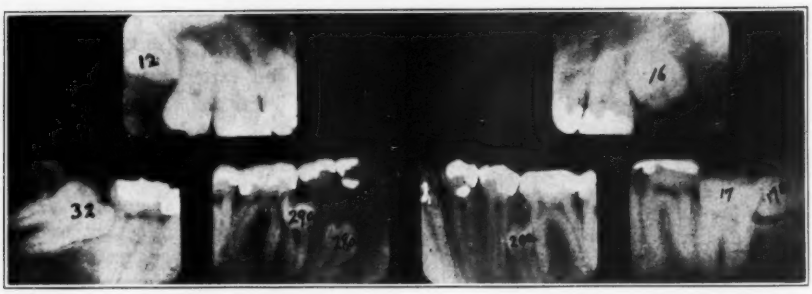


Fig. 4.—Supernumerary fourth molars (*12* and *17a*); supernumerary bicuspids (*20a, 28a* and *29a*); and unerupted third molars (*16, 17* and *32*).

gressing to the point where correction is no longer possible.

A recent survey made in Oregon for the United States Public Health Service indicates that 91 per cent of the elementary school children are in need of dental attention, that 50 per cent show some degree of malocclusion and that orthodontic

treatment is to be recommended in 30 per cent of those children who have reached the ages of 12 to 14 years. The examination of these children for the purpose of the survey could not be thorough because of the conditions under which it was made, but it indicated that approximately three cavities existed in the teeth of every child examined. My experience teaches me that from 25 to 40 per cent more caries exists in children's mouths than can be found without the use of the roentgen rays.

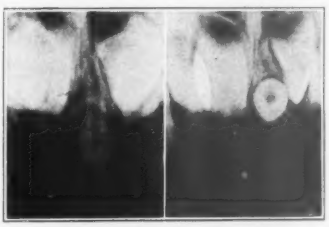


Fig. 5.—Supernumerary teeth causing irregularity of developing permanent central incisors.

To diagnose dental conditions intelligently, a periodic roentgenographic examination is necessary, and there is no branch of dental practice in which the use of the roentgen rays is more valuable than in children's dentistry.

Roentgenographic examinations of children's teeth should be made at regular intervals beginning with the second year, in order to follow the development of the deciduous and permanent teeth and for the detection of conditions leading to malocclusion, abnormal development and degenerative diseases.

Some of the more common abnormalities of tooth development not discovered until too late without the use of the roentgen rays are caries, congenital absence of teeth, the presence of supernumerary or impacted teeth, periapical infection, the presence of cysts and conditions involving the investing tissues of the teeth.

Fig. 6.—Supernumerary teeth.

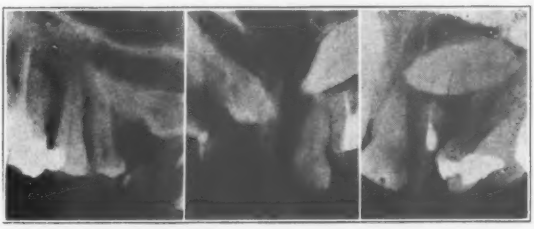


Fig. 7.—Impacted upper cuspids and pulpless lateral incisor; absorption of process and irregularity.

Profile roentgenograms are valuable for the records both of the dentist doing work for children and of the orthodontist and should be used more often.

The accompanying illustrations emphasize the importance of the use of the roentgen rays in children's dentistry by showing the serious results of the lack of their use.

I have stated that from 25 to 40 per cent more dental caries may be uncovered by a roentgenographic examination than by the usual method employing mouth mirror, explorers and visual inspection.



Fig. 8.—Unerupted impacted lower central and lateral incisors and cuspid.

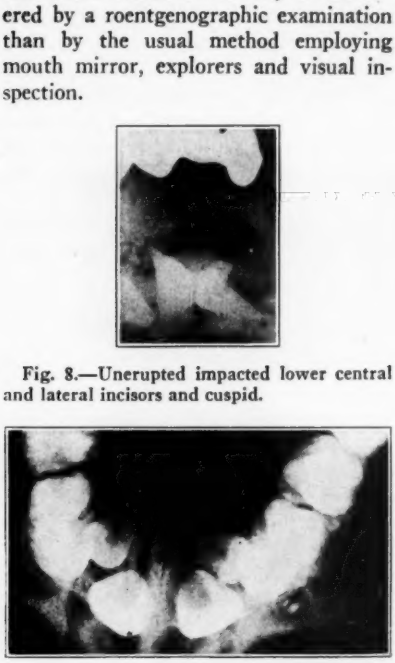


Fig. 9.—Occlusal film showing position of unerupted lateral incisors.

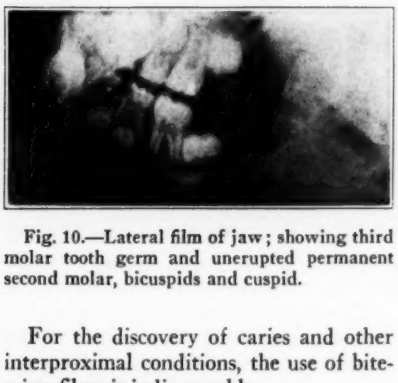


Fig. 10.—Lateral film of jaw; showing third molar tooth germ and unerupted permanent second molar, bicuspids and cuspid.

For the discovery of caries and other interproximal conditions, the use of bitewing films is indispensable.

Figure 1, a bitewing film, shows posterior teeth of a boy aged 14. These roentgenograms were taken less than one year after the youth's mouth had been cared for by his dentist without the use of the roentgen rays. Twenty cavities were found, some of them already beyond the danger line. These might

Fig. 11.—Profile view showing excessive protrusion of upper central and lateral incisors and cuspids.

Fig. 12.—Normal development of jaw; good facial contour.

have been detected in time by the early use of the roentgen rays.

Deciduous teeth are sometimes retained beyond the normal time of exfoliation, and there is often an urge to remove them in the hope that the permanent teeth will more readily erupt. Such a procedure might be a serious mistake, as is shown in Figure 2, left, a deciduous molar (*T*). The permanent second bicuspid has failed to develop and the molar being in good condition, should be retained.

Figure 2, right, shows early loss of a second deciduous molar resulting in lack of space for the eruption of the bicuspids, with consequent impaction and malocclusion. The use of the roentgen rays at this stage of development enables the dentist to institute proper treatment.

Figure 3 shows an unusual condition, congenital absence of twenty-two permanent teeth. An early roentgenographic examination would certainly have been enlightening.

Impacted and supernumerary teeth are not uncommon, but Figure 4 is startling. The patient, a college student, a youth aged 20, had an impacted lower right third molar, two impacted supernumerary lower right bicuspids, an impacted supernumerary lower left second bicuspid, an impacted lower left second molar and a supernumerary fourth molar, an unerupted upper left third molar and an unerupted impacted upper right fourth molar. There were five impacted supernumerary teeth. An early roentgenographic examination might have saved this patient much future trouble.

Figure 5 shows impacted supernumerary teeth in the upper central region, causing serious irregularity of the permanent teeth. Early discovery will give opportunity for the correction of such a condition and the prevention of future disability.

Unusual conditions are often unsuspected until serious damage has been done. In Figure 6, the presence of two supernumerary teeth lying linguad from the permanent central incisors has caused a condition difficult to correct.

Impaction of the upper cuspids is the cause of malocclusion, often resulting in resorption of the adjacent tooth roots and apical infection, and may be a factor in muscular and nervous diseases of the eyes. Figure 7 is an illustration. A pulpless lateral incisor, alveolar absorption and irregularity of the central and lateral incisors and bicuspids may be noted. Orthodontic treatment is rendered difficult and often impossible when such a condition is not disclosed at an early age.

Figure 8 shows an impacted lower right cuspid and lateral and central incisors in a man about 45 years of age. He complained of an irritation that had been present as long as he could remember. Suppuration and infection were more or less constant for several years. The value of early roentgenographic diagnosis is evident.

Figure 9 is an occlusal roentgenogram of unerupted lateral incisors. Roentgenographic examination is valuable for localizing impacted upper or lower teeth.

Figure 10 is an extra-oral lateral roentgenogram of the jaw showing deciduous teeth and unerupted permanent teeth in position. This type of film is helpful in any case, but is particularly useful when intra-oral examinations are difficult. Extra-oral examinations may be made to cover the entire arch, from three to five exposures.

Profile views of patients are valuable to the orthodontist as well as the prosthodontist. Figure 11 shows a case of malocclusion and extreme protrusion of the upper central and lateral incisors and cuspids. The outline of the soft tissues graphically illustrates the facial contour before treatment.

Figure 12 is a profile view of an adult with normal jaw development and good facial contour. Profile views taken of patients during the course of orthodontic treatment form a valuable, interesting and permanent record.

These illustrations are but a partial indication of the many uses of the roentgen rays in children's dentistry. They emphasize the value of regular roentgenographic examinations: (1) as a means of periodic checking up as regards caries and interproximal conditions; (2) to prevent abnormalities from developing to the extent that removal or correction is difficult or impossible, and (3) to prevent degenerative diseases of the teeth from progressing until they become a serious menace to health.

If there is ever to be established an era of immunity from dental ills, it must surely begin with the correction and treatment of dental disease in the child, and in the education of children in rational methods of oral hygiene. The first step in the care of children's teeth by the general practitioner, the orthodontist or the pedodontist should be a routine roentgenographic examination and periodic checking up, including the use of bitewing films in examination of the posterior teeth. This will enable the dentist to recognize degenerative diseases of the oral structure in the beginning and to institute remedial measures that will go far in the prevention of the serious systemic results of such conditions.

Remember: There is no substitute for the use of the roentgen rays in children's dentistry.

729 Medical Dental Building.

# DENTAL PROCEEDINGS OF THE NINETY-EIGHTH MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE*

## Histopathologic Changes of Teeth During Caries

BY M. W. MC CREA, D.D.S., DEPARTMENT OF ANATOMY*

THE first microscopic evidence of caries seems to be a broken enamel surface under which is found transversely striated enamel rods. As caries approaches the dentino-enamel junction, there is a lateral spread, with consequent undermining of enamel walls and large dentinal involvement. Many avenues of primary invasion, such as branched dentinal tubuli and interglobular spaces, are open to the advance of caries in the dentin. While dentin destruction is going on, there is a physiologic attempt to wall off the carious advance by a sclerosing of the dentin, as well as the deposition of secondary dentin. Poorly developed teeth, in which are found many poorly calcified areas, offer less resistance to the carious processes; a condition which may explain rampant caries in many cases.

*Rochester, N. Y., June 17, 1936.

*University of Rochester, School of Medicine and Dentistry.

## General Body Conditions and Dental Caries

BY J. FRANK HALL, D.D.S., B.S., DEPARTMENT OF PATHOLOGY

Clinical and laboratory investigations have conclusively proved that systemic disturbances do increase susceptibility to dental caries. The inherited form of the teeth, with their deep pits and fissures,

crowding and malposition in the arches, makes them more susceptible to the attack of bacteria. The age is important, as caries is prevalent during early childhood and particularly through adolescence. The endocrine glands exert an influence on the formation of the teeth, which renders them more susceptible to caries. A thyroid deficiency retards eruption, while a parathyroid disturbance results in irregularity of the structure of the teeth. Childhood diseases, such as scarlet fever, measles, mumps, chickenpox, and diphtheria, affect the structure of the teeth if the latter are in the developmental stage at the time the patient is suffering from the disease. That osteomalacia and glandular changes promote caries in the expectant mother has not been definitely established. General bodily conditions may affect the structure or alter the environment of the tooth and thus render it more liable to become carious.

### Relation of Saliva to Dental Caries

BY ROBERT E. BRAWLEY, B.S., D.D.S., M.S., DEPARTMENT OF PEDIATRICS

The author lists certain properties and constituents of the saliva as being causative or preventive of dental caries, the reaction or acidity and alkalinity of the saliva being the most important. An acid reaction is favorable to dental caries, while an alkaline reaction is unfavorable. The diet and general health affect the salivary reaction. Certain other factors in the development of caries are: rate of flow and viscosity, and the presence of bacteria and yeast, mucin and enzymes.

### Bacteria and Dental Caries

BY M. K. HINE, D.D.S., M.S., DEPARTMENT OF BACTERIOLOGY

The possibility that the presence of micro-organisms might be the cause of dental caries has been considered since the introduction of the germ theory of disease. A number of species have been thought guilty of causing dental caries, but as yet none of the theories regarding any one group have been completely substantiated. Many bacterial species found in the mouth are capable of producing acid strong enough to decalcify tooth structure. To study the bacterial flora of dental caries, material from the very base of forty-one cavities was examined microscopically, by a method devised in the laboratory of the University of Rochester School of Medicine and Dentistry. In every case, a complex mixed flora were found; which indicates that this location favors no particular group of organisms. In other words, direct study of carious material gives no evidence that dental caries is a specific bacterial disease. Rather, it tends to support the idea that any species of oral bacteria that can produce acid in appreciable quantities can cause dental decay.

### Protective Action of Enamel Surface

BY BASIL G. BIBBY, B.D.S., PH.D., DEPARTMENT OF BACTERIOLOGY

As a result of surface changes on the enamel, a protective layer is formed on the teeth, which may make them less susceptible to dental decay. This natural self-protective capacity of teeth explains why dirty teeth do not always decay and why decay becomes less active as teeth grow older. If this protective process can be brought about by artificial means, the prevention of much dental decay should be possible.

### Chemical Constitution of Carious Teeth

BY MARIAN L. LE FEVRE, M.S., DEPARTMENT OF BIOCHEMISTRY AND PHARMACOLOGY

The data concerning the chemical composition of sound and carious human teeth may be divided into two classes,

those on whole teeth containing carious lesions and those on separated sound and carious tooth tissue. With the exception of an increase in moisture with caries, analyses of whole sound and carious teeth show little difference in composition. On the other hand, the few available analyses show that isolated carious dentin contains more water, organic matter and magnesium and less calcium and phosphorus than does sound dentin. In spite of the technical and analytic difficulties involved in obtaining values for constituents in separated sound and carious tissue from the same tooth, because of the lack of available analyses, the need for careful research on such a problem is clearly indicated.

### Diet and Dental Caries

BY RICHARD S. MANLY, B.S., M.A.,
DEPARTMENT OF BIOCHEMISTRY

Although statistical comparison of changes in diet due to civilization and of certain clinical studies suggest that employment of high carbohydrate diets brings about dental caries, most of the work with experimental animals does not support this conclusion. Also lack of vitamins A, B or C, excess or lack of vitamin D and improper relative amounts of calcium and phosphorus in the diet, have been linked with the cause of caries by certain investigators. As other workers fail to agree, more work is needed before the questioned effect of any single food factor is definitely evaluated. There is one point of agreement: A good (adequate) diet is more effective than a poor diet in arresting or preventing dental decay.

### Physical Properties of Carious Tissue

BY HAROLD C. HODGE, B.S., M.S., PH.D.,
DEPARTMENT OF BIOCHEMISTRY AND
PHARMACOLOGY

Classical and present-day studies of thin sections of teeth bearing cavities have recently been supplemented by the application, particularly in German laboratories, of polarized light methods. Changes in the birefringence and anomalous colors indicate the complicated nature of the structural changes associated with caries. Lessening of the specific gravity of carious tissue reflects the removal of mineral matter of high specific gravity, a finding corroborated by chemical studies. Quantitative roentgen-ray absorption studies developed in this laboratory show that between a carious infection and the living pulp, the tooth sometimes builds a dyke of hypermineralized dentin roentgen-ray absorption of which may be as much as 40 per cent greater than that of normal dentin. Hardness studies show that carious tissue varies from the softness of putty to a hardness almost equal to that of the normal dentin, this depending on the degree of infection. The hypermineralized dyke seen in the roentgenogram may be from 30 to 40 per cent harder than normal dentin.

### Sequelae of Dental Caries

BY HAMILTON ROBINSON, D.D.S., M.S.,
DEPARTMENT OF PATHOLOGY

Not only is dental caries harmful in that it may cause impairment of the digestive processes, but also, through the avenue of dental caries, an entrance is afforded for infection of the dental pulp and, subsequently, any tissue of the body. From the infected pulp, there may be an involvement of the periapical region with resultant periapical abscess, dental granuloma or dental root cyst. Locally, there may be a destructive osteomyelitis, cellulitis or Ludwig's angina. As potential foci of infection, these local lesions resulting from dental caries may lead to arthritis, nephritis, cardiac disturbance or other systemic disease. The prevention, treatment and repair of carious

areas are not therapeutic measures limited to the care of individual teeth or the oral cavity, but are means of preventing serious general systemic complications with possible fatal outcome.

## Bacteriophage and Its Relation to Oral Infection

BY LESLIE A. SANDHOLZER, PH.D., DEPARTMENT OF BACTERIOLOGY

The use of bacteriophage in the treatment of oral infections has received enthusiastic endorsement by some workers. Thus, Raiga and others have reported its successful use in treating dental abscesses and pyorrhea. Many investigators have found it valuable in cases of osteomyelitis and localized infections. The successful employment of phage is dependent on (1) its specificity for the invading micro-organism; (2) the state of dissociation of the organism, and (3) the retention of its lytic activity in the presence of tissue and tissue débris. In the majority of cases, the organism causing oral infection is not known and so rational phage therapy is not possible. Even when it can reasonably be assumed that the invader is a staphylococcus or streptococcus, unless its lysability by the particular phage is determined, the lysate may have no influence on the course of the infection. Bacteriophage is inactivated by tissue, tissue débris and saliva and so has very little opportunity to act even when the other conditions for lysis are satisfactory. In view of these facts, it seems most probable that the success obtained therapeutically with bacteriophage must be due to some process other than bacteriolysis. Any one of the following theories may explain its therapeutic value: (1) lysates may act as vaccines, and so vaccine therapy and not bacteriophage is being employed: (2) protein shock from the crude lysate may stimulate other protective mechanisms in the host; (3) the patient may be suffering from a temporary invasion of a nonpathogenic micro-organism that can be eliminated spontaneously.

## General Anesthesia in Dental Surgery

BY J. A. GREENHOUSE, D.D.S.

Three reels of motion pictures were used to demonstrate the use of nitrous oxide-oxygen with synergists and ethyl chloride in child cases and minor oral surgery. Ethyl chloride is preferred for general anesthesia in children with the patient carried only to the period of rigidity, i.e., incomplete anesthesia. With nitrous oxide-oxygen-carbon dioxide mixture for complete anesthesia, ethylene, ethyl chloride, anesthol or ether is used as a synergist, to increase the efficacy of the gas combination. Uncertain signs of depth of anesthesia, such as cyanosis and jactitation, are eliminated. Larger amounts of oxygen may be used to increase the margin of safety.

## Fluorine Content of Enamel and Dentin

BY W. D. ARMSTRONG, M.D., PH.D., AND P. J. BREKHUS, B.A., D.D.S., SCHOOL OF DENTISTRY AND LABORATORY OF PHYSIOLOGICAL CHEMISTRY (UNIVERSITY OF MINNESOTA)

With a procedure[1] adapted to the determination of microgram quantities of fluorine, the content of a sample of mixed human enamel was found to vary from 0.0155 to 0.0163 per cent. The fluorine content of the dentin of the same teeth was found to lie between 0.0200 and 0.0207 per cent. The analyses of carious teeth made to date indicate a lower fluorine content in the enamel, but not of the dentin of these teeth.

1. Armstrong, W. D.: Ind. & Eng. Chem. (Analytical Edition) 8:384, (Sept. 15) 1936.

### The Relationship of Fusiform Bacteria and Oral Spirochetes

BY M. K. HINE, D.D.S., M.S., DEPARTMENT OF BACTERIOLOGY

The almost constant association of fusiform bacteria of the mouth with oral spirochetes has suggested to many bacteriologists that there might be a generic connection between them. During a prolonged study of sixty-one strains of *B. fusiformis*, indications of this possible relationship were sought. Two of the three cultivable morphologically different species often revealed twisted and spiral elements, but definite motility was never observed. No differences in staining reaction were noted between typical *B. fusiformis* and the spiral organisms. Furthermore, the spirillary elements did not closely resemble oral spirochetes morphologically. It was concluded that the spiral forms noted in pure cultures of *B. fusiformis* were in no way related to oral spirochetes.

### A Method for Cutting and Grinding Hard Tissue Sections

BY HAMILTON ROBINSON, D.D.S., M.S., DEPARTMENT OF PATHOLOGY

Slabs about 0.5 to 1 mm. thick are cut from teeth with screw-slotting cutters mounted on a bench miller. The slabs are then mounted on small metal disks after the method suggested by Chase[2] and ground thin by hand on successive carborundum disks mounted on a horizontal grinding lap. They are finished on a similar hard Arkansas stone disk and mounted in balsam. The method affords reasonably thin (10-12 micron) sections, approximately planoparallel and free from grinding material and avoids waste of tooth tissue. Several such sections can be made from a single tooth. The method is readily adaptable for combined hard and soft tissue sections.

2. Chase, S. W.: J. D. Res., 10:251 (June) 1930.

## PRACTICAL SUGGESTIONS ON INLAY CONSTRUCTION*

By CARL H. SCHEU, D.D.S., Lakewood, Ohio

PRACTICAL observations have taught us that the cast gold inlay in the hands of certain operators is the means par excellence for replacing lost tooth structure. Much research has been done to bring this ideal inlay within the scope of every dentist. Routine examination of patients shows that many cast gold inlays constructed by conscientious operators frequently are unsatisfactory. We also see many satisfactory restorations which probably have a history of several impressions and several castings to account for their excellence. Failure when it is experienced by the conscientious operator may usually be attributed to the accumulation of errors in the different steps of inlay construction. Frequently, the operator attributes his failure to conditions other than those responsible for his error. Attention will be called to

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

the causes of these common errors and scientific methods to eliminate these errors will be presented.

### CAVITY PREPARATION

The anatomy of the tooth should determine whether the slice preparation is selected in preference to the Black or box type preparation. On bell-crowned teeth, much tooth structure is lost and more gold is visible when the slice preparation is carried out. On thick-necked teeth, these conditions are reversed, and a modified slice preparation may be very valuable. All slice preparations should have a definite locking groove or a modified proximal box for retention.

The method used in constructing the inlay should influence us in cavity preparation. It is an axiom that no model is so accurate as the original. Therefore, when the indirect technic is used, the margins of the cavity should have a longer bevel to allow for finishing against the tooth. The cavity should be made more retentive when the indirect technic is used because some retention will be lost through inaccuracies of the model. Typical Black preparations should only be used in conjunction with an accurate direct technic.

The effect of operative procedure on the dental pulp is of utmost importance. Paul H. Jeserich, of Ann Arbor, Mich., has demonstrated the high degree of heat generated and the pathologic changes produced in the dental pulp by improper instrumentation. Equally important is the choice of the materials to be used in deep cavities. Toxicology should have taught us not to use phenol, especially in diluted solutions, near the dental pulp. Many materials recommended for a base in deep cavities contain phenol. A knowledge of the composition and the biologic action of materials that are to be placed near the dental pulp is imperative. A thick paste made with chemically pure zinc oxide powder and eugenol is recommended as a safe base. A 2 per cent solution of chloramine-T is recommended as an antiseptic. Chemically pure carbon tetrachloride is recommended as a non-irritating drying and cleansing agent.

### IMPRESSION TAKING

Under impression taking, we must first decide whether the direct or indirect technic is to be used. Success with the indirect technic depends on the accuracy of the model, and accuracy is limited by the physical behavior of the materials used in taking the impression. Modeling compound impressions taken with well-fitting bands and held under pressure while cooling will have a shrinkage of from 0.3 to 0.4 per cent when cooled to room temperature of 70 degrees. Inlay wax impressions taken in the same manner will have a shrinkage of from 0.5 to 0.7 per cent. An elastic compound recommended for inlay impressions had a shrinkage of from 0.6 to 0.8 per cent and showed more warpage than modeling compound or inlay wax. The method and materials used in model construction greatly affect the accuracy of the model. Copper, electrolytically deposited from plating solutions the temperature of which is 100 F., practically compensates for shrinkage in impressions. Amalgam alloys may either shrink or expand, this depending on the alloy and manner of manipulation. These figures definitely show the advisability of using modeling compound for indirect impressions when no attempt is made to compensate for shrinkage in the impression in constructing the model. The economic factor should also be considered in choosing a technic. For accuracy and economy, we should become proficient in using the direct technic, avoiding technics that require extra steps and more time to obtain the same results. The di-

rect technic should be the method of choice in all simple cases. In the more complicated cases, the so-called indirect-direct technic, using an accelerated stone model to facilitate carving the wax pattern before the final finishing is completed on the tooth, is equally satisfactory.

### WAX PATTERN

The wax pattern is more frequently responsible for poorly fitting castings than is the casting technic. Many failures attributed to the casting technic are caused by faulty wax patterns. A wax pattern with definite sharp margins is not necessarily an accurate wax pattern.

In constructing a wax pattern for either an indirect model or directly on the tooth, the principles of wax manipulation remain the same. Many wax patterns constructed on indirect models are poorly made. They should be made in the same manner as a direct impression.

There are three methods in general use at present for taking direct impressions. The first consists of warming a medium hard inlay wax either in dry heat or warm water, forcing the wax into the cavity with or without the aid of a matrix, rebasing the cervical aspect and slightly rewarming the impression, then forcing it back into the cavity and holding it under pressure until cooled.

The second method is frequently referred to as the liquid wax method. The technic consists of melting hard inlay wax into a matrix and while the wax is in a semiliquid state forcing it to place and holding it under pressure till it is cooled.

The third technic consists of placing a matrix around the tooth and forcing wax into the cavity by the aid of a syringe and holding it under pressure till cooled.

The accuracy of these technics or any other technic can be determined only by constructing under similar conditions wax patterns that can readily be measured. Cavities shaped similarly to those in teeth were formed with precision gage blocks. Impressions were taken with the different technics and accurately measured, and the following results were obtained. When inlay wax, heated to the lowest temperature that will permit easy manipulation, is forced into the cavity and held under pressure, there is an average shrinkage of 0.4 per cent. When liquid wax is used, the shrinkage is generally from 0.6 to 0.8 per cent. Impressions made with a syringe show shrinkage as great as 1.6 per cent. None of these patterns show loss of detail on visual examination. These experiments show the futility of choosing a technic visually.

The shrinkage obtained in these patterns was due to thermal shrinkage and elasticity of the wax. When we apply this information to a mesioclusodistal inlay pattern that has not been rebased, we find that our pattern is short on the cervical aspect the amount of thermal shrinkage caused by the difference in temperature where the wax stopped flowing and mouth temperature plus a shortage caused by the elasticity of the wax, the total amount in the favorable technic being 0.4 per cent.

In a rebased pattern, there is the same thermal shrinkage, but the elasticity of the wax is working with instead of against our efforts. The elasticity of the wax in the rebased pattern is practically the same as the thermal shrinkage, thereby giving us a pattern that is not short at the cervical aspect at mouth temperature. It is obvious that all other margins of a wax pattern behave similarly to the cervical margin. The proximal margins should also be rebased well toward the occlusal surface. To correct the accessible margins the wax should be melted against the tooth with a very fine instru-

ment such as a small contra-angle root-canal plugger.

This information formulates the following simple technic for obtaining accurate direct impressions.

Warm the wax, preferably in warm water, to the lowest temperature that will permit easy manipulation. By the aid of an adjustable matrix, force the wax into the cavity. Remove the impression from the cavity without cooling. Rebase the cervical margin and cervical portion of proximal margins. Slightly rewarm the impression, force it back into the cavity and hold it under pressure until cooled. Do not chill. Remove the impression from the tooth and remove the matrix. Trim all excess wax from the cervical and proximal margins with a sharp scalpel. Replace the pattern on the tooth, carve the occlusal surface, correct the accessible margins by melting the wax against the tooth with a fine instrument and finish the proximal and cervical margins with silk binding tape.

The experiments also clearly demonstrate the necessity for constructing wax patterns for indirect models in the same manner if best results are to be obtained.

Owing to the elasticity of the wax, a pattern can be readily removed from a cavity that has a slight undercut. An accurate casting made from such a pattern will not go to place. The operator frequently attributes this failure to the casting technic. When a failure has occurred, the cavity preparation should always be checked before an operation is repeated.

## INVESTING

After an accurate wax pattern is obtained, the investing operation must be such that no error develops in making the expanded casting mold. Here again, the physical properties of the material used must determine the technic.

The physical properties of modern investments that produce volumetric changes are normal and hygroscopic setting expansion, thermal expansion and shrinkage, caused by the cooling of the investment. Uncontrolled hygroscopic setting expansion is responsible for most of the errors developing in casting technics. Hygroscopic setting expansion may be defined as the increased setting expansion obtained when moisture comes in contact with investment while it is setting. The simple procedure of lining an inlay ring with wet asbestos will produce a setting expansion from 1 to 1.5 per cent in most investments. It is obvious that if the investing technic develops setting expansion sufficient to compensate for casting shrinkage, no thermal expansion should be used.

The manner in which the asbestos liner is placed in the ring greatly affects results. An asbestos liner placed tightly against the ring will permit expansion to take place only toward the ends of the ring. Distortion of the casting will be the result. With a loosely placed asbestos liner, the setting expansion will take place in all directions, an accurate casting resulting.

Normal and hygroscopic setting expansion may be reduced by the resistance offered by the wax pattern. This loss is marked in full crown and large mesioclusodistal patterns and practically nonexisting in three-quarter crown or one and two surface patterns. When a thin mix of investment is used, this difference is increased. A thick mix of investment practically eliminates variables of this type. Because of the resistance offered by the wax pattern to setting expansion, certain operators recommend a different amount of expansion for different types of patterns. Uniform results are obtained in all types of patterns with the same expansion when a thick mix of investment is used. Large castings do not shrink more in proportion than smaller castings. Thin castings shrink less than thicker

castings. Full-crown patterns do not require more expansion than other castings if all the computed expansion is obtained.

It appears that by removing or reducing setting expansion in investments, the chances of error are reduced. Such is not the case. As the case is heated for wax elimination, the wax pattern expands and produces pressure on the investment. This pressure, particularly in green molds, will cause expansion of the molds for one or two surface inlays. In three surface inlays, this pressure compresses the investment core and causes shrinkage of the casting at this point. This expansion was noted by the older operators and was responsible for the recommendation that a case should be burned out as soon as the investment had set. It was also responsible for the practice of soaking a case in water before wax elimination, if the case had been allowed to stand overnight.

Thermal expansion of investment to compensate for casting shrinkage was accepted by the profession in preference to wax expansion and the numerous combination expansion technics then in use. Compensation for casting shrinkage by thermal expansion alone is not an accomplished fact, and there is much evidence against its ever becoming a reality. With thermal expansion, there is warpage; which can readily be understood, as the plaster in the investment disintegrates and shrinks, while the refractory material expands when heated. Thermally expanded molds shrink rapidly during the average casting operation owing to cooling. Frequently as much as one half of the expansion is lost. The surface finish of the casting seldom is so satisfactory as that of those made with low heat technic.

When one considers the variables possible in constructing an expanded casting mold, the necessity for a simple accurate technic founded on scientific principles is clearly demonstrated. The standardization of an investment for hygroscopic setting expansion gave us a simple technic that will satisfy every condition arising in inlay casting. When the inlay ring is loosely lined with wet asbestos, the investment develops a setting expansion sufficient to compensate for casting shrinkage. To have accurate fitting castings for all types of cavities with the same investing technic, a thick mix of investment must be used. A wax pattern is easily invested in a thick mix of investment by the aid of a vibrator. As no thermal expansion is desired, the wax pattern is eliminated under 800 degrees F. Inexpensive electric hot plates are satisfactory for wax elimination.

For the man who wishes to control the casting technic for wax shrinkage and difference in gold shrinkage, hygroscopic setting expansion is controlled by time. The available hygroscopic setting expansion diminishes by increasing the time the investment is permitted to set before moisture comes in contact with it. With this technic, the expansion can be controlled to an accuracy of 0.1 per cent.

Any method of casting that will give satisfactory results may be used.

Much has been said about overheating gold in casting. Oxidation of the base metals and the occlusion of gasses in the noble metals are more deleterious than the high heat. Occluded gasses are given off at high heat and the tendencies of the metals to segregate are reduced. Oxidation is prevented by use of a reducing flame and a reducing flux.

All castings show warpage, and when examined at a magnification of 40 diameters show voids. A bead on the sprue reduces warpage and porosity.

Castings made from measured wax patterns always showed a taper when sprued at one end, the large end being away

from the sprue. This shows the effect of gold feeding into the mold and the fact that the greatest accuracy is obtained by placing the sprue in the center of the casting.

### CEMENTATION AND FINISHING

Less has been written about cementation and finishing than any other step of inlay construction. It has been an established custom to finish the margins of the castings against the tooth and then cement to place. This was the proper procedure with castings of such accuracy as it was possible to obtain with older casting technics. It is now possible to make castings, particularly in occlusal and cervical cavities, that fit the tooth accurately so that they will not go to place if the margins of the casting are finished against the tooth before cementation.

Measurements made to determine the thickness of a film of cement between smooth surfaces showed it to be from 0.0008 to 0.002 inch, this depending on the consistency of the mix. Since tooth and inlay surfaces are not absolutely smooth, it is easy to understand that the cement film may keep an inlay 0.002 inch or more from being seated. This shows the soundness of rebasing the gingival margins of the wax pattern, the advisability of relieving the pulpal surfaces of some of the castings and the folly of such remarks as "An inlay requires no grinding or finishing after cementation."

Another interesting experiment consists in placing some cement between two microscope slides and pressing it into a thin film. With thin mixes or mixes rapidly made, a film is obtained that contains numerous holes. With certain cements, it is impossible to make such a film without holes. If the cement has a shrinkage, cracks develop in the film after it has set. By exerting intermittent pressure on the edge of the film large voids are produced. This is analogous to having an inlay rock in a cavity.

These experiments show that zinc phosphate cement must be mixed slowly, and to the maximum consistency that will permit the insertion of inlays. The cavity should be completely filled and cement applied on the inlay to avoid the occlusion of air and the formation of voids while seating. As soon as the inlay is seated, the margins should be finished against the tooth.

### CONCLUSION

The accumulation of errors frequently responsible for the failure of an inlay is demonstrated in the following case:

The operator prepared a mesioclusodistal cavity on an upper first bicuspid. The tooth being bell crowned and the operator selecting the slice preparation, much tooth structure was lost and much gold was visible. The preparation had proximal grooves, but not definite locking grooves. The occlusal step was of adequate depth for strength and retention. Apparently some of the retention was lost in model construction. Inaccuracies in the wax pattern or casting technic produced a casting that gave evidence of requiring burnishing and grinding of the margins. This finishing operation produced an inlay that did not show a cement line on cementation. Apparently, it was found necessary to grind the occlusal step for occlusion after cementation. A bitewing roentgenogram would have shown an occlusal step less than 1 mm. in thickness. The inlay came out in less than one year.

Many patients have been disappointed with inlays of this type and many members of the profession have criticized the cast gold inlay for various reasons, but there is no type of work in the field of operative dentistry that will give more lasting satisfaction than a scientifically made cast gold restoration.

14805 Detroit Avenue.

# USE OF OBTUNDENT IN OPERATIVE DENTISTRY*

By LEROY L. HARTMAN, D.D.S., Sc.D., New York City

THE success of any method or technic for reducing the discomfort of a patient while in the dental chair depends to a great extent on the skill and judgment of the individual operator.

We all know operators so skilful that they rarely have to resort to anesthetics or medication except in cases of extreme sensitivity of the dentin.

When I read my paper entitled "A New and Effective Means for Dentin Desensitization," I was considering only cases of extreme sensitivity of the dentin. Each experimental case was proved to be definitely sensitive to the scraping of an instrument over the exposed dentin, the pressure from an instrument in the attempt to remove caries or the definite reaction resulting from the use of a bur or stone.

While we know that patients dread the dental chair because of the pain associated with the cutting of sensitive dentin, we recognize also that there are other factors which are equally important in a consideration of the whole problem of reducing discomfort in preparations for fillings in vital teeth.

To a large percentage of patients the vibration resulting from the use of a bur or stone is a source of real annoyance, and many of them develop an itching of the nose which makes the use of the engine an instrument of torture to them.

How important do we consider the running condition of dental engines and handpieces? Many handpieces in use are in such poor condition that burs and stones revolved in them jar the patients until they become almost hysterical.

Burs should be sharp, and, used intelligently, the inverted cone burs cut dentin most effectively and with the least creation of heat. Burs which are used to cut enamel and dentin at the same time soon develop broken cutting edges, unnecessary vibration resulting. Unless mounted stones are kept true and are handled carefully when in contact with tooth structure, the bumping of irregular surfaces is a constant source of annoyance to the patient.

So far, nothing has been developed to take the place of sharp cutting instruments for expeditiously shaping cavities in teeth with a minimum of discomfort. They are limited in their use when preparation is extended into sound tooth structure because it is necessary to undermine the sound tooth structure with burs before it is possible to cleave the enamel effectively.

When considering patients in various age groups, we must realize that it is very difficult for many people of any one of these groups, especially children, to distinguish between vibration and pain.

It is not my desire to consider pain as associated with pulp changes or periodontal disturbances, but to confine my observations to the association of pain with exposure of the dentin in our efforts to save teeth and restore them to function.

*Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

I quote from the paper mentioned earlier my theory in regard to sensitivity of dentin: "The dentin must contain lipoids which play an important part in the transmission of sensation in and through the dentin." On the basis of this theory, my solution for the reduction of sensitivity of dentin was worked out. The formula you are all familiar with, but I should like to bring out certain points which will help you to obtain more satisfactory results from its use.

I did not realize that within twenty-four hours after the presentation of the formula many thousands of persons would be compounding and attempting to use the solution. A formula without technical details is almost useless, and yet attempts were made to use it in Bombay, India, as well as here in San Francisco, without detailed knowledge of the technic.

Many substitutions were made for the original constituents and the solution was neither accurately compounded nor bottled to prevent volatilization. Today, many reliable manufacturers are making a good solution and it is also well bottled.

I repeat the formula for those who make their own solutions. The proportions are by weight: thymol, 1¼ parts; ethyl alcohol (95 per cent), 1 part; anesthesia ether, 2 parts. The solution should be kept tightly corked in a dark glass bottle and, in very warm climates, should be kept in a cool place. While thymol and alcohol are both volatile, they are fairly stable as compared to ether. The solution is inflammable and therefore must be kept away from open flames. I am asked frequently how long the solution should remain stable. In our experience, after opening a bottle, it has been possible to continue its use in many cases over three months' time. The only precaution taken was to keep the bottle tightly corked except when it was opened for use.

As ether boils at 95 F., the bottle must not be filled to the top in warm weather, in order to allow for the expansion of the ether. This same fact should be considered when the solution is used in the mouth, because, even with the mouth open, the temperature in the posterior areas is not reduced to a very great extent below that of the normal mouth temperature of 98.6 Fahrenheit. This point is especially important in adults, in attempts to make an application in a disto-buccal cavity in an upper third molar. Children open their mouths so wide that the temperature problem is not so serious, if the applications are not made posterior to the first permanent molars.

If one attempted to make an application in the mouth, the temperature of which is close to the boiling point of ether, almost as rapidly as the solution was applied, the ether would boil and volatilize, so that the solution in all its elements would not remain in contact with the dentin long enough to become effective.

If we could remove the teeth that we wish to desensitize and place them in a test tube or retort, and pour some solution over the exposed dentin, the problem would be easily solved.

In using the solution in the mouth, in addition to keeping the temperature in mind, it is necessary to keep saliva and blood out of the field of operation so the solution may come in direct contact with the sensitive dentin. The presence of saliva and blood in the field would prevent this being accomplished.

It is therefore most desirable to isolate the tooth thoroughly, and we have such a means available in the form of the rubber dam. A minimum number of teeth are isolated and vaseline is rubbed on the under surface of the holes to facilitate

placing the rubber dam. Also, in this way, a thin film of vaseline is left on the underlying soft tissues, preventing any irritation from this solution in case of a leak. After the rubber dam has been applied, I usually swab the entire field of operation with 70 per cent ethyl alcohol. In addition, the cavity may be swabbed out with a 2 per cent solution of sodium bicarbonate. The cavity or exposed area of dentin should then be wiped dry with a pellet of absorbent cotton, and not dehydrated by warm air. The details of the applications I should like to present when we consider the applications to the various types of cases.

If you prefer to use cotton rolls, your results may not be entirely effective, and in order to protect soft tissues from the effects of ether when it is confined, it is desirable to coat the tissues first with vaseline. The cavity is packed temporarily with cotton, and the vaseline is swabbed over the soft tissues, especially where the cotton rolls are going to be placed. The cotton rolls are inserted and the temporary packing in the cavity is removed and the application made. If any solution comes in contact with the cotton rolls, it is desirable to change them immediately.

In making an application, it is suggested that a solution of sodium bicarbonate be ready for the patient to rinse the mouth; or the tissues under the rubber dam may be swabbed with it, if a burning sensation is reported.

If a cavity is kept dry after the application of this solution on sensitive dentin, the diminution of sensation will be noted for a period of over one hour's time. If the cavity becomes moistened after the application has been made, it is desirable to dry the tooth and make another application before proceeding with the operation.

Just what should be expected of this solution in dentin desensitization and what are the indications and contraindications to its use?

1. Let us consider pain as experienced by the patient before coming to the dentist. As I reported in my last paper, many cases of so-called pulpitis respond to an application of this solution. In these cases, most cavities contained caries. On removal of the caries and the insertion of metallic fillings with cement bases, the symptoms have disappeared, and, up to the present time, the teeth seem to be perfectly normal. The pulps respond to all of our clinical tests, and the dentin seems to have returned to its normal sensitivity. There had been a question in many of the cases so treated as to whether to extract the tooth or remove the pulps, because the pain did not cease on treatment with the usual medicaments. I have called this particular condition dentinitis and the name dentinalgia has been suggested to me.

Lester Cahn, of the division of oral pathology, has reported to me two cases of upper molars which had caused the patients considerable pain. He extirpated the pulps and the pain ceased, but, on examination of the sectioned pulps, he could observe no structural changes that might have played a part in the discomfort of the patients.

I am more than ever convinced that many aching teeth have been extracted or pulps removed that might have responded to treatment with this solution. When patients complain that eating sugar causes pain, usually there is some caries present in a tooth, on the removal of which and sealing of the cavity, the ache stops. The solution proves invaluable in opening the cavity in such cases, because there is usually extreme sensitiveness even to the touch of an explorer. The presence of poorly sealed inlays or leaky fillings without caries may result in the patient's obtaining a similar reaction to sugar. The

removal of the inlay or filling and the proper sealing stops the discomfort. Sensitive necks of teeth, of which patients complain, may be given temporary relief until some other more permanent measure may be taken.

2. Let us consider pain as experienced by the patient while in the dental chair having operative preparations made on vital and sensitive teeth.

When the patient experiences thermal sensitiveness on taking ice water or a hot drink, the pain is of a short duration and the patient does not usually complain. But let the same patient, seated in the dental chair, have cold or hot air strike a large exposed area of dentin and there will be a very definite response. Let the operator use a disk of stone too rapidly in polishing a filling, and the patient will complain of the pain caused.

In cutting cavities in teeth, it is not the deft strokes with sharp cutting instruments that distress the patient, but the cutting with burs, using a steady and heavy pressure; which very shortly elicits a definite response.

The desensitizing solution is indicated in cavities that are too sensitive to touch or cut with burs or sharp cutting instruments. When it has been applied and is effective to the extent that these tests indicate, one cannot expect to be able to cut with a heavy steady pressure on the burs much beyond the area of application into sound tooth structure and not obtain a pain response.

One of the greatest advantages of using the solution is that it will desensitize hypersensitive dentin and permit careful cutting, but any attempt at reckless cutting will result in a pain response that will let the operator know when too much heat is being created. In this way, the pulp may be safeguarded from unnecessary and undesirable injury.

The solution is not intended to deaden the pulp. Many operators have been misinterpreting the results of their use of the solution because they have expected a complete blocking of all forms of sensation.

The solution is not effective if applied over sound enamel, but is very often effective if applied over etched enamel. The area of effectiveness is usually the immediate vicinity of the application, so that, as extensions are made into sound tooth structure, additional applications are necessary.

Now for the technic of application which has been found most satisfactory in various types of preparation in teeth.

1. If the cavities are filled with caries and the tooth is sensitive, the first application should be made with a moistened pellet directly over the carious area, and then, on removal of the caries, another application should be made on a dry pellet packed in the cavity.

2. In the majority of the cases, if the cavities are open, or the removal of the caries does not cause pain, the cavities are packed with dry cotton pellets and the application then made with a larger pellet well saturated with the solution by dipping of the pellet in the bottle. The pellet is removed from the bottle and immediately pressed against the cotton in the cavity. The solution is not to be poured into a dappen dish nor the saturated pellet placed on a towel before being brought in contact with the tooth. When the cavity is packed with dry cotton, it is possible to make contact with areas involved by undercuts, point and line angles. If an attempt is made to pack a moistened pellet in a cavity, much of the solution will be squeezed out during the attempt and not enough solution remain in the cotton to in any way prove effective.

The length of time that the solution should be held in contact varies with the

age of the patient. Cavities in deciduous molars and the first permanent molars of children up to 10 years of age usually require a one minute application.

The adolescent require one and one-half minutes' and adults from one and one-half to two minutes' application. As patients reach middle or old age, two or three applications may be necessary before there is sufficient desensitization to proceed with the operation. In a woman of 80, I was able to obtain complete desensitization of some exposed dentin in six minutes' time after making three applications of two minutes each. Of course, there are always exceptions in all biologic reactions.

In order to have some definite plans in making applications to the various types of cases, let us consider preparations in groups and methods of approach that will result in a maximum benefit from the use of this solution.

1. *Deciduous Molars.*—The cavities are usually fairly wide open and not usually sensitive to the excavation and preparation of cavities. If they are sensitive, the teeth are isolated with cotton rolls, the gums first being protected with vaseline. The cavity is packed temporarily with cotton to prevent it from being filled with vaseline. After the cavity is wiped dry with a pellet of cotton, a dry pellet is packed into the cavity so that it is completely filled with the cotton. Then application is made on a larger pellet than the one in the cavity, dipped into the bottle of solution and applied directly from the bottle to the cotton in the tooth and held in contact with the cotton pliers for one minute.

2. *Deciduous Anterior Teeth.*—Cotton rolls are usually sufficient for the isolation, and practically the same method and period of application should be observed as for the deciduous molars.

3. *First Permanent Molar.*—In children, this tooth often presents very sensitive Class 1 cavities. Small pit and fissure cavities in these teeth are the most difficult in which to obtain satisfactory results with the solution. If the tooth is only partially erupted, it is desirable to isolate it by the use of cotton rolls; if it is fully erupted, the application of the rubber dam over the single tooth is advocated. When it is possible to make an opening through the enamel with a round bur and expose the sensitive dentin, the desired result may be obtained by the use of a small piece of cotton rolled into the form of a wick so that one end would be narrow enough to be packed through the prepared opening to make contact with the dentin or caries, one beak of the cotton pliers being used for the purpose. The other end of the wick should be broad and bulbous so that it could rest on the surface of the enamel. The application is made on a fairly large pellet pressed to the surface portion of the cotton wick. It is desirable in these cases to extend the application time to one and one-half minutes.

Large occlusal cavities in the first permanent molar are very successfully treated with the solution. The single tooth is isolated and an attempt is made to remove the caries with a spoon excavator. If there is pain, a pellet of cotton is moistened with the solution and pressed against and held in contact with the carious area for one minute. The cotton is removed and a gentle whiff of warm air is employed. The remainder of the caries is then removed. If the underlying dentin responds to the pressure of the excavator, the cavity is packed with a dry pellet and another application is made on a larger pellet and held in contact for one and one-half minutes. After several gentle whiffs of warm air, two minutes is allowed to elapse before cutting with a bur is started. Usually, an application of this

type in the central portion of the crown will permit the widest extensions on the occlusal surfaces without additional applications.

4. *Class II Cavities in Bicuspids and Molars.*—(*a*) Small proximal areas of caries on mesial or distal aspect not extending onto the occlusal surface: The single tooth is isolated, or additional teeth, if you prefer, with the rubber dam. Before application of the solution, a point is selected on the occlusal surface that will be included in the outline form of the finished cavity, and a small round bur is sunk through the enamel until the dentin is reached. If the preparation is not painful, it is continued without the solution. If the dentin is found to be extremely sensitive, a larger round bur is employed through the opening made in the enamel to enlarge the opening considerably. While making this cut, the operator withdraws the bur occasionally to cool it.

Next, a wick of cotton is packed down into the base of the opening and the application is made with another pellet on the bulbous portion remaining on the surface, the pellet being held in contact for one and one-half minutes, in a young patient, for two minutes in an adult. Both pellets of cotton are removed, a few whiffs of warm air applied, and, after two minutes, cutting is begun. This time, a medium size inverted cone bur is used to cut laterally in the dentin toward the caries on the proximal aspect. In many cases, the single application is sufficient, but if it is not, a second application may be made by packing a pellet of dry cotton into the opening made by the inverted cone bur. This is usually sufficient to permit the complete shaping of the cavity, including the gingival margin; which will be definitely accomplished if the carious portion of the tooth is opened from the occlusal surface before the second application is made. An undermining and chipping off of the marginal ridge with a chisel certainly reduces the time and the possible shock to the patient in making this type of preparation.

(*b*) Small proximal cavities on both the mesial and distal surfaces, but not extending onto the occlusal surface: Before isolating, the operator cuts a trench across the central portion of the occlusal surface from mesial to distal aspect, using a knife-edged stone in the engine and keeping it cool with a stream of water until the dentin is exposed. Then the rubber dam is applied, the tooth is dried with cotton, the prepared trench is packed with cotton and the application is made on this packing. Two minutes is ample for this procedure in young patients. In older patients, it is sometimes desirable to make two applications of one and one-half minutes each on the packed cotton. The whiffs of warm air are used and, at the expiration of the two minute waiting period, it is usually possible with an inverted cone bur and cutting instruments to prepare the cavity in this type of case with little discomfort to the patient. If, when the gingival angles are squared, sensitive areas are encountered, these should be packed and an application made for one minute. This is usually ample to permit a complete cavity preparation.

(*c*) Large open proximoclusal cavities: These rarely present any difficulties. I have found it desirable, when two surfaces are involved, to pack the cavity with two pellets of cotton, one on the proximal surface and one on the occlusal surface, then making the application on a large pellet held against those in the cavity. If three surfaces are involved, I have found it desirable to pack the cavity with three pellets, one on each proximal surface and the third on the occlusal. Then the application is made with a large pellet, which is pressed against the pellets in the cavity.

The use of this solution in some cavities of this type is contraindicated because of the difficulty of preventing saliva from seeping into the cavity, and also cases so far in the posterior part of the mouth that the temperature will drive off the ether as fast as the solution is placed in the teeth. Such a case, for example, may be a large distoclusal cavity with a buccal extension in an upper third molar.

5. *Cavities on the Proximal Surfaces of the Anterior Teeth.*—These are rarely problems. The isolation with the rubber dam is simple, as it is if cotton rolls are used. One packing and one application in the larger cavities are usually sufficient. In the smaller cavities, where it is desirable to make extensions through sound tooth structure, a second application may be necessary. One and one-half minutes for the application, with a two minute waiting time, usually obtains the desired results.

6. *Gingival Third Cavities.*—The rubber dam may be very easily applied over the single tooth that is to be operated on.

If removal of the caries is painful, and this applies also to many cases of etched enamel, a first application is made on a moistened pellet of cotton held in position over the involved surface with the beaks of the cotton pliers straddling the tooth, one beak being on the mesial surface, the other on the distal surface. At the expiration of one and one-half minutes, the pellet is removed and the warm air used gently. After two minutes, a spoon excavator is used, if the caries is soft, or an inverted cone bur in the engine, if it is hard, so as to cut from the central portion of the caries toward the desired outline form. In young patients, one application is usually sufficient. In older patients, where the caries is fairly hard, after removal the underlying dentin may be found to be quite sensitive. If so, it is desirable to pack the cavity with dry cotton and make a second application before completing the cavity preparation.

It is sometimes possible to isolate a row of gingival third cavities and make one application after another so that, during the two minute waiting period, another cavity may be treated. In that way, the systematizing of the applications will save some operative time and the patient will not have any objections if all of the cavities are prepared at one time.

At the expiration of the time of application of the solution, the pellets in the cavities should be removed and several gentle whiffs of warm air be applied to the area of application. The dentist then waits two minutes before starting to operate. In my original instructions, I used the word "blast" of warm air, and many operators used so much hot air that the tooth responded to the heat. At the same time, they were volatilizing the thymol and the complete reaction could not take place. By the use of too much hot air, a desiccation of the cavity also occurred; which was contrary to my instruction.

In using compressed air for this purpose, the valve is turned down so that only about 3 pounds of pressure is used. The hand bulb syringe is a very satisfactory instrument for the purpose.

The tooth is kept dry and, at the expiration of the two minutes' waiting period, operation is started, with inverted cone burs for the extensions. The operator makes a lateral cut and then removes the bur, allowing it to cool between cuts so there will be no danger of thermal response. Sharp cutting instruments for shaping the cavity, used with deft strokes, soon open the cavity to the desired form. Warm air should be used to blow out the chips as the operator proceeds. The cavity may be completed with cutting instruments, fissure burs, stones, or disks, as

preferred, the operator keeping in mind possible thermal response.

Up to this time, we have considered preparations where caries was being treated. There are several general considerations that I should like to draw attention to in presenting some of my own observations.

There are a great many operators using this solution in the preparation of bridge abutments and in the preparation of teeth for jacket crowns. The technic differs only in the fact that cuts must be made through the enamel with knife-edged stones or disks before the applications are made.

For inlay preparations, trenches are cut through the enamel on the buccal and lingual surfaces at about the location for the finished walls on those surfaces, and then a knife-edged cut is made across the occlusal surface, such as I described for preparing the tooth in a Class II cavity when the occlusal surface was intact. One of the simplest methods, then, of making the application is to fit a thin band matrix over the tooth. After isolating and drying the surfaces of the prepared tooth, the operator packs dry cotton into the matrix so that all involved surfaces are reached, using sometimes three or four small pellets to accomplish this. Then with a large pellet well saturated with the solution, he makes the application, seeing that this pellet remains moist for from three to five minutes. To accomplish this, in warm weather especially, two or three applications should be made, or a small medicine dropper may be used to apply the solution. The cotton packed into the matrix is taken out, the warm air is used and the matrix removed. In many cases, it is not necessary to make another application, but if sensitive dentin is encountered during the preparation, it is only necessary to apply the solution to the localized area.

For jacket crowns, teeth are treated in the same way, three longitudinal cuts being made through the labial enamel from incisal to gingival aspect in an anterior tooth and, in a posterior tooth, three cuts on the buccal and lingual from occlusal to gingival aspect before the matrix is applied and the application marked. In these preparations the applications should be made from three to five minutes in all cases. If preparation is made by undermining of the shell of enamel from the occlusal aspect, the opening so made is an ideal one into which to pack the application.

In making three-quarter crown preparations, the only portion of the preparation which may reach sensitive dentin is made in cutting the mesial and distal grooves. Packing pellets of cotton moistened with the solution against these areas usually have proved ample to permit the cutting of these grooves.

Many operators have been reporting to me that they have found the solution very valuable in scaling calculus from sensitive teeth. An orangewood stick is dipped in the solution and then rubbed on the sensitive areas. We have found that if the gingival areas are merely swabbed with the solution, the pain experienced by some patients when the rubber clamps are used is eliminated; as is also the case when patients suffer during the use of strips in finishing fillings.

In taking impressions for jacket crowns, gold crowns or inlays, if fitting of the band results in discomfort, this can be eliminated by swabbing the preparation with a moistened pellet, some of the solution being allowed to flow into the gingival crevice.

The solution is particularly valuable in preventing shock resulting from the fitting of inlays and crowns on sensitive dentin and also in preventing shock in cementing inlays and crowns. The preparation is merely swabbed for one-half

minute with a pellet of cotton moistened in the solution.

Cavities that have had previous fillings or treatment with phenol or silver nitrate will sometimes be found difficult to desensitize. One of the best ways to handle these cases is to do the cutting with an inverted cone bur so as to expose a small area of fresh dentin before making the application.

In Volume III of the new revised edition of Black's Operative Dentistry will be found a very clear-cut description of the indications for and methods of application of this solution in operative procedure.

I wish to express appreciation to the dentists in all parts of the world for their cooperation in sending me the results of their observations. Out of these combined efforts will come a better understanding and appreciation of the attempts being made to eliminate the discomfort incident to sensitiveness of the dentin.

# REACTION OF OSSEOUS TISSUES TO PRESSURE UNDER PARTIAL RESTORATIONS*

By HUGH W. MacMILLAN, D.D.S., M.D., F.A.C.D., Cincinnati, Ohio

Intermittent Pressure.—According to the views of certain authors, Jores in particular, the important thing is the intermittent character of the pressure. A continuous pressure favors resorption. But if this pressure is applied intermittently at long enough intervals, then during the intervals without pressure, there is proliferation of bone in the exact place where the pressure exerted its effect.[1]

A LARGE part of the six-year preparation for the practice of dentistry is devoted to subjects fundamental to the nature of and the indications for partial restorations. If the foundations for these restorations were lifeless, their design would be as exact as mathematics. The fact that they are placed on a foundation of living tissues is among the reasons for the six years' preparation.

Not only are living tissues different from the wood and metal of the engineer, but also the tissues of each individual patient differ and react in a manner characteristic of that patient alone. The mucosa, the thickness of the cortical plate and the pattern of the cancellous tissue have different characteristics in different patients. The teeth and supporting structures vary markedly. Systemic conditions enter into the picture. Of particular interest at the present time is the allergic reaction of certain patients to the newer denture bases.[2] Lastly, the age of the patient determines in large part the amount of bone regeneration following extraction and the reaction of the bone to the constructive or destructive stimulation of the prosthetic restoration.

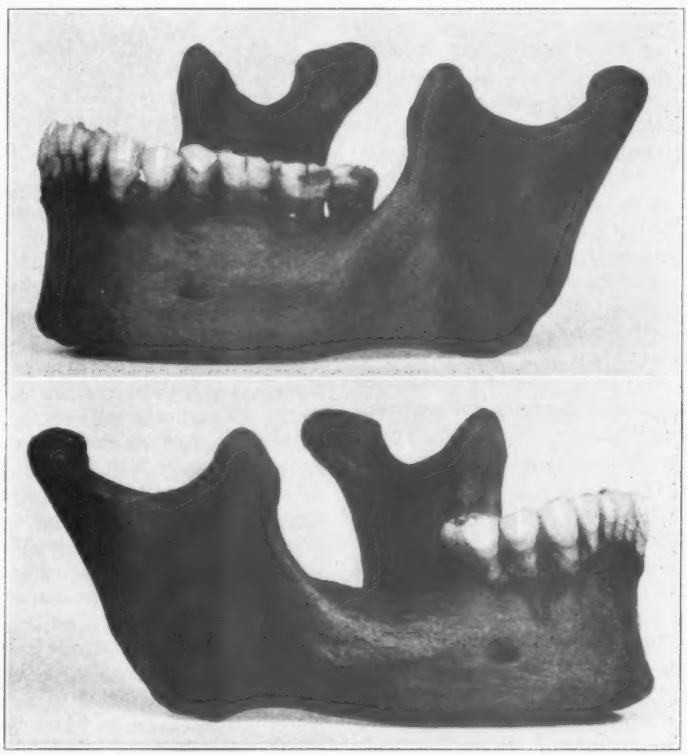
The accompanying photographs, made to exactly the same scale, of the right and left halves of a mandible show that the alveolar process has not "disappeared"

*Read before the Section on Partial Denture Prosthesis at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

1. Leriche, R., and Policard, A.: Normal and Pathological Physiology of Bone, St. Louis: C. V. Mosby Co., 1928, p. 100.

2. Rattner, Herbert: Stomatitis Due to Sensitization to Dental Plates, J.A.M.A., 106:2230 (June 27) 1936.

after the extraction of the molars. On the contrary, by actual measurement, the width of the body of the mandible from the lower border to the upper border in the molar region is slightly greater than on the corresponding side, where the teeth are present. This phenomenon may be explained by mathematical analysis of the mechanical stresses of this region, changed in form and function by loss of the molars. The region of greatest bending stress of the mandible is located just anterior to the attachments of the masseter and internal pterygoid muscles. With the loss of the molars on the right side, the "weight arm" became longer as chewing was shifted anteriorly to the bicuspids, and thereby greater leverage was created. The muscle of mastication which played a large part in producing this leverage and which had most to do with determining the external contour of this re-



Right and left halves of mandible made to same scale. The alveolar process has not "disappeared" after the extraction of the molars. On the contrary, by actual measurement, the width of the edentulous portion of the mandible from the lower border to the upper border is slightly greater than the width of the corresponding opposite portion of the mandible where the molar teeth are present.

gion was the temporal. The internal and external oblique lines may be interpreted as continuations of the temporal tendon, which act similarly to the supporting cables of a suspension bridge. Application of additional weight nearer the center of a suspension bridge produces an increase in tension or straightening of the supporting cables. The addition of bone on the upper border of the mandible in the edentulous molar region may be interpreted as a straightening of the internal and external oblique lines, a result of the load being shifted to a point nearer the center. Changes such as these are illustrative of Wolff's law. The mandible shown in the accompanying illustration is evidently that of a male in his early thirties, free from local pathologic disturbances of the alveolar border, and at an age when "osteogenetic adaptability" proceeded with vigor.

The formation of a cortical layer of bone across the opening of a mandibular molar alveolus under favorable conditions following extraction of the tooth is in conformance to the laws of bending stress as has been described in former papers.[3] This cortical layer may be demonstrated under fixed bridges in the mandibular molar region in roentgenograms, making clear the explanation that the development of a cortical layer is not necessarily due to intermittent pressure of a tissue-borne appliance on the alveolar border. In the case of a removable bridge supplying the first and second molars supported on the second bicuspid and third molar by clasps provided with occlusal rests, the effect on the cortical bone of the alveolar border is the same as that of a fixed bridge which does not touch the gum. In tooth-borne appliances, the chief function of the saddle is to keep food from collecting under the bridge during chewing. The stress of mastication is transmitted to the bone through the agency of the clasps and occlusal rests on the supporting teeth, not by the saddle resting on or near the gum. The appliance, in its effect on the bone, is the same as a fixed bridge.

In an editorial, the late Hart J. Goslee defined the modern clasp as follows:

> By modern clasp is meant a *narrow*, oval-shaped clasp well adapted to the greatest circumferential dimensions—or to what has been designated as the *height of contour*—of the crown of the supporting tooth, and *always* provided with *occlusal* and *embrasure* rests.[4]

Dr. Goslee insists that the clasp should *always* be provided with occlusal rests. Clasps with occlusal rests may *always* be indicated for all tooth-borne appliances. The facts of the case are that partial dentures in cases with no posterior supporting teeth, without occlusal rests, or even without clasps of any kind around the anterior teeth, have been worn by patients for thirty years or more with perfect comfort and have remained in perfect occlusion. The only complaint is that in eating taffy they get mixed up somewhat with the candy. These appliances beautifully illustrate the effect on bone of intermittent pressure with long intervals of rest. Apparently, these tissue-borne appliances have contributed to the density of the cortical bone on which they rest. Their intermittent stimulation "has produced proliferation of bone in the exact place where the pressure exerted its effect."[1] The fact that they have remained for years in perfect occlusion indicates that their effect on the ridge is constructive, not destructive. Their clinical suc-

3. MacMillan, H. W.: Radiographic and Histologic Evidence of Functional Adaptation of Alveolar Process, J.A.D.A., 15:316 (Feb.) 1928; Nonuse in Development and Resistance of Alveolar Process, ibid., 15:511 (March) 1928.

4. Goslee, H. J.: Clasps, editorial, D. Craftsman, September, 1928.

cess has been demonstrated over long years of service, and last, and by no means least, they fit into the economic needs of the present time.

Suppose, to one of these claspless partial dentures, clasps without occlusal rests were added. They would increase its stability, but at what expense! A tissue-borne partial denture does not rest on an unyielding base and cannot be held immovable during mastication. A broad tight fitting clasp would produce continuous leverage on the tooth around which it was fitted and would act as an orthodontic appliance or as extracting forceps in slow motion. A tight-fitting narrow clasp may prevent the leverage on the tooth, but the continuous pressure produced would cause pressure atrophy under the saddle and sinking of the appliance out of occlusion. A loose-fitting clasp would allow "physiologic" movement of the denture, but at a cost to the tooth over which it rubs. Suppose an occlusal rest were added to the clasp: immediately, there is created one of those compromising hybrid appliances that is neither tooth-borne nor tissue-borne. A mathematical analysis of such an appliance would be difficult indeed, since a large part of the force of mastication is dissipated through the occlusal rest to the tooth and a small part through the posterior extremity of the saddle to the gum tissue. In actual practice, it is doubtful that it makes much difference whether the force transmitted through the saddle to the alveolar ridge is analyzed, as the remaining natural teeth, no matter how few in number or how plentifully interspersed by artificial teeth, do most of the masticating. It is interesting to contemplate how the old lady with the two opposing teeth in the upper and lower jaws would manage with "modern" partial dentures. In my opinion, she would continue to use her natural teeth exclusively until they were painlessly extracted by the "well-fitted clasps with occlusal rests."

If the consideration of esthetics were removed from the indications for partial dentures, their claims of restoring lost masticating surfaces, space retaining, keeping opposing teeth in function and being agents for prevention of pyorrhea alveolaris would be insufficient to class them as indispensable.

If the progress of partial denture prosthesis is considered from the standpoint of one interested in the reaction of the alveolar process to changes in form and function, it would seem that the greatest advances in restorative dentistry have been made in substituting for the fixed bridge the sanitary, removable tooth-borne appliance supported by clasps with occlusal rests. It is difficult to see much advance in the design of tissue-borne appliances. In fact, the arbitrary demand that all "modern clasps" be provided with occlusal rests has had a most destructive effect on the clasped teeth in the case of those appliances without posterior supporting natural teeth and has overlooked the possibilities of the functional stimulation of the tissue-borne saddle, which, I believe, may be so designed as to be truly physiologic. Gnathodynamometric measurements of the force that may be exerted on the alveolar ridge by tissue-borne saddles compare very favorably and, in some cases, are almost identical with measurements made of the force exerted between adjacent opposing natural teeth.

The physiologic design of partial dentures with no posterior abutment teeth depends primarily on the application of the principle of intermittent pressure to the alveolar ridge. The force of mastication should be distributed evenly over the supporting bone by a well-fitted saddle, which should be released from the

tissues at the end of the masticatory excursion. The even distribution of the forces of mastication by the saddle is prevented by an occlusal rest on a tooth located at one end of the saddle. The release of the denture is prevented by a tight fitting spring clasp. The three factors intermittent pressure, continuous pressure and disuse atrophy are to be chiefly considered in the physiologic design of partial dentures.

### CONCLUSION

Constructive changes in the bone are due chiefly to the bending and compressive stresses produced by the remaining natural teeth and would occur whether prosthetic restorations were present or not. If the prosthetic restorations work in harmony with these constructive changes, they may be considered as physiologic; if in disharmony, as pathologic. The distinction between intermittent pressure, continuous pressure and disuse atrophy is indispensable for the correct interpretation of the local changes in the bone produced by partial dentures. Claims of physiologic stimulation cannot be made unless the appliance is actually functioning, and it often is not, as long as natural teeth are available for chewing. The clinical success of the tissue-borne saddle over long periods of years proves it to be a truly physiologic appliance. The principal difference between the dentist with his six-year scientific education and the dental laboratory technician is the former's ability to apply the principles of physiology to the design of prosthetic restorations.

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## A REVIEW OF PERIODONTAL DISEASES*

By M. MONTE BETTMAN, D.M.D., F.A.C.D., Portland, Ore.

DISEASES of the soft tissues of the oral cavity constitute one of the most important groups of pathologic conditions with which the dentist is concerned. These conditions are more prevalent than caries of the teeth and as important as regards the health as is disease in any other part of the body.

Unfortunately, the dentist to whom is entrusted this important field often overlooks early diagnosis in his eagerness to find cavities in the teeth or areas calling for the replacement of missing teeth. Although this phase of dentistry is important, the general practitioner should place even more importance on the health of the periodontium or supporting tissues of the teeth. No matter how well a piece of restorative work is done, unless the supporting tissues are placed in a state of health and maintained in this condition, the result will be failure.

Efforts should be directed toward prevention of disease both in the hard structures and in the soft tissues rather than in correction after disease has occurred. When preventive measures have failed or have been neglected, curative measures become necessary.

Periodontal diseases, if recognized in their incipiency and properly treated, are easily cured. Only those cases in which

*Read before the Section on Periodontia at the Seventy-Eighth Annual Session of the American Dental Association, San Francisco, Calif., July 15, 1936.

proper treatment has been delayed become complicated and more difficult to handle and may require the services of the trained periodontist. It is important, therefore, that the family dentist, who usually sees the patient at more or less regular intervals, makes differential diagnosis early and institutes treatment for relief of the condition.

The most common diseases of the periodontium, with which every dentist should be familiar, are: gingival recession, gingivitis, Vincent's infection and periodontoclasia.

### GINGIVAL RECESSION

Gingival recession has been divided into three different types: atrophic, abrasive and inflammatory.

*Atrophic Gingival Recession.*—This condition, which is due to a wasting away of the crest of the alveolar process, is usually uniform throughout the mouth. The treatment consists in an effort to prevent additional loss of tissue, with further recession. Oral cleanliness should be maintained at a high level and toothbrushing so practiced that a stimulation of the tissues will result. Thorough prophylactic care is necessary at regular intervals.

*Abrasive Gingival Recession.*—This condition is usually found on the buccal and labial surfaces of the teeth; while on the lingual surfaces, the gingival tissue is in normal relation. This type of recession is usually caused by improper brushing. Treatment consists in instructing the patient in the proper method of toothbrushing and in correcting any traumatic occlusion that may be present. In neither one of these conditions can the destroyed tissue be replaced, but with proper care further loss may be prevented.

*Inflammatory Gingival Recession.*—This type differs from the other forms in that it is accompanied by inflammation, which is dependent on a disease process. Pocket formation and suppuration are usually present. Treatment consists in determining whether the cause is Vincent's infection, gingivitis or periodontoclasia and taking steps to correct the causative condition.

### GINGIVITIS

Gingivitis is an inflammation of the gingivae. The earliest symptoms are a redness and a tendency to hemorrhage of the gingival tissue. The condition is usually caused by an irritation such as traumatic occlusion; the presence of faulty fillings or crowns or tartar; food impaction due to loss of the contact point or lack of oral cleanliness. In other words, anything that lowers the resistance of the gingivae to infection may cause the disease. It should be remembered that normal gingivae are pink, and any deviation from the normal should be immediately noted and an effort made to determine the etiology. In its incipiency, there is no pus present in gingivitis and the patient is often not aware that any pathologic condition is present. It is the duty of the general practitioner to recognize this abnormal condition early and to inform the patient of its existence. Treatment at this time consists in thorough prophylactic care, correction of traumatic occlusion, the elimination of all sources of irritation and the correction of faulty contact points. All deposits must be removed from the gingival sulcus. The patient should then be instructed in home care of the mouth. He must be taught how to use the toothbrush efficiently and should be impressed with the fact that it is the brush that does the work rather than any dentifrice that may be used, in spite of what he has been led to believe by radio broadcasts and other advertising.

It is with early gingivitis that the general practitioner should be most concerned, for he can render the patient the

greatest service early in the disease and with a minimum of effort; if the early symptoms of gingivitis are not recognized and thus the disease is neglected, there is a slow progression of the disease process until finally there is pocket formation, with pus, and the treatment then becomes more complicated.

### VINCENT'S INFECTION

Vincent's infection, commonly termed "trench mouth," should be easily diagnosed by the family dentist. It can, if handled correctly, be readily cured without referring the patient to the specialist; but should the dentist not wish to assume the responsibility of treating this infectious and contagious disease, he should waste no time in seeing that the patient is placed in the hands of one who devotes his time to this type of practice. This disease, which involves the gingivae, especially the septal and that just distad from the third molar, may be associated with gingivitis or periodontoclasia, or it may occur alone.

It is characterized by a more or less sudden onset, a necrotic sloughing of the gingival tissues, the presence of a fetid breath which is always characteristic, and bleeding on the slightest touch. The chief diagnostic signs are a grayish white slough along the border of the involved gingivae which, when wiped off, leaves a raw bleeding surface; a bad taste; malaise; a slight rise in temperature, and the very characteristic odor, which, once noted, is never forgotten.

Vincent's infection is due to the presence of a spirochete and fusiform bacillus known, respectively, as *Bacillus fusiformis* and *Borrelia vincenti.* These organisms, which may be found in almost every mouth, attack only tissues that have been weakened by some other agency. A well-cared-for mouth in which the tissue tone is high and with no locally irritated gingival areas is not apt to be invaded by this disease. It is therefore apparent that the dentist should see that his patient receives regular periodic prophylactic treatment and efficient home care of the mouth.

The disease is very contagious and care should be taken not to transmit it to others. It may be spread by direct contact, such as kissing, and by the use of common drinking cups, dishes, etc.

Treatment consists in the use of drugs that liberate oxygen and thus devitalize the organisms responsible, which are anaerobic, and in the establishment of a high standard of oral cleanliness. Smoking, especially of cigarets, should be discouraged during treatment. Numerous drugs are used in treatment, such as sodium perborate, hydrogen peroxide, chromic acid, silver nitrate and aniline dyes. A treatment that has been found to give satisfactory results is as follows: After a positive diagnosis, the teeth and gingivae are scrubbed thoroughly with a cotton roll dipped in a mixture of tincture of green soap, 1 part, hydrogen peroxide, 2 parts, and water, 3 parts. Then the interdental spaces are sprayed with a dilute solution of hydrogen peroxide and the mouth is rinsed with water. All diseased areas are then treated with a 5 per cent solution of chromic acid; and, immediately thereafter, about a teaspoonful of hydrogen peroxide is put in the mouth and the patient is instructed to close the lips, holding the acid and peroxide in contact with the tissues for a period of three minutes. The treatment is repeated on the following day, after which the teeth are carefully and thoroughly scaled, the operator being sure to remove all deposits, overhanging fillings, sharp edges of cavities and any other sources of irritation that may be present. The elimination of all irritation is of prime importance to successful treatment of this disease.

At the first visit, the patient is given a

solution of 1:2,000 corrosive mercuric chloride in hydrogen peroxide, to be used diluted with equal parts of water as a mouth wash every one or two hours.

On the third visit, instruction is given in home care of the mouth and the necessity for maintaining oral cleanliness by proper brushing is explained. Attention is also given to the diet.

Recently, treatments by intravenous injections of neo-arsphenamine have been given, especially by the physician, without attention to the local treatment. This method of treatment should be discouraged; for while it will usually cause subsidence of the acute symptoms, it will often not effect a cure and, as a result, we find many so-called subacute or chronic cases of Vincent's infection.

Extractions or other operations in the oral cavity should be postponed until the disease is under control.

### PERIODONTOCLASIA

Periodontoclasia, or paradentosis, commonly termed pyorrhea, is a disease process that causes a breaking down of the tissues surrounding the teeth. It has long been the nemesis of the dental profession, and many have in the past been negligent in its presence or prone to disregard it, with the thought that, as the disease cannot be cured, its presence might as well be ignored until such time as it becomes necessary to extract the teeth. Let me correct this more or less prevalent prognosis still common among general practitioners. Periodontoclasia can be and is being cured, and, once cured, the tissues can be maintained in a state of health provided proper care is exercised by both the patient and the dentist. As with all diseases, the ideal time to treat periodontoclasia is in its incipiency or before it has reached the suppurating stage. At this time, a thorough prophylactic treatment, including the removal of all irritants, such as deposits and faulty overhanging restorative work, and the correction of traumatic occlusion will clear up the inflammation and allow the tissue to again become normal. If the early symptoms of periodontoclasia are overlooked and so allowed to go untreated, the disease process progresses until, in the latter stages, there are loosening and loss of teeth and even a breaking down of the health of the patient, due to absorption of pus from the pockets surrounding the teeth. It is only when proper treatment has been too long delayed and the disease allowed to progress until practically all the supporting tissues have been destroyed from around the root of the tooth that it is incurable.

The dentist should be on the alert to detect periodontoclasia and should be able to diagnose it readily. The chief symptoms are inflammation of the gingivae, absorption of the alveolar process, with or without recession of the gingivae, pocket formation, formation of pus and tooth mobility. In the earlier stages, one or more of these symptoms may be absent. Of all these symptoms, pocket formation should be regarded as most distinctively characteristic. Many cases of periodontoclasia, on first examination, may appear to be only a simple gingivitis; but, on closer examination, pocket formation, even though slight, will be noticed, definitely pointing to a diagnosis of periodontoclasia. Looseness of the teeth and suppuration often do not occur until the advanced stages of the disease.

The most common etiologic factors are the presence of deposits, lack of oral cleanliness, food impaction, overhanging of margins of fillings and crowns, traumatic occlusion and probably nutritional deficiency. Treatment consists in the elimination of all of these conditions. Traumatic occlusion, which may be present, should be corrected; gingival mar-

gins of fillings smoothed; contact points restored, and all deposits and septic material removed from the necks and roots of the teeth. The last, which is of the utmost importance, requires a painstaking and delicate planing of the involved root surfaces.

Several methods of treatment for the elimination of the infection and the obliteration of the pockets have been devised by different operators. These may be grouped into two main types: the conservative and the radical. The former resort to subgingival curettage; while the latter prefer surgical methods, such as gingivectomy or the flap operation. Regardless of which method is used, the object to be obtained is, as has been stated, elimination of infection and the obliteration of the pocket. Some periodontists use only one method; while others often use both, the choice depending upon the case at hand.

For the general practitioner who may wish to treat these cases, and especially should he take care of the incipient ones, I would recommend subgingival curettage. This method of treatment involves the least destruction of tissue and, if properly and thoroughly employed, will restore the tissues to a state of health.

For this method of treatment, either the curet type or the hoe type of scaler may be used. They will accomplish the same result if efficiently used. The number of instruments should be kept to a maximum of fifteen or twenty. It matters not which type of instrument is used as long as efficient apoxesis is accomplished. With subgingival curettage, anesthesia is very seldom necessary, and all deposits, as well as all septic material present, can be removed with very little discomfort to the patient. The skill necessary for this technic can be acquired by any dentist who is sufficiently interested to apply himself. The general practitioner who is untrained in the handling of this disease should commence with the treatment of the less advanced cases, and until such time as he is able to get desired results, he should not hesitate to refer the more advanced cases to the trained periodontist.

It cannot be too emphatically stated that drugs have no place in the treatment of periodontoclasia. The essential thing is the elimination of all etiologic factors in the disease, followed by allowing the blood clot to fill the pocket. The introduction of drugs into the pocket will destroy this clot. There are no drugs at the present time, and there probably never will be any, that can be relied on in themselves to cure this disease. I am emphasizing this fact because many dentists are attempting to cure the disease by the easy method of using medicaments that have been advertised by the manufacturers as a means of treatment.

Every dentist can assist in the prevention of this prevalent disease by instructing his patients in home care of the mouth and by educating them to the necessity of having regular periodic prophylactic care and the importance of attention to the diet. Until more is known of the last, reliance must be placed on hygiene. Prophylactic care means the thorough removal of all deposits from the necks and sulci of the teeth and not merely the polishing of the exposed surfaces. At this time, any overhanging fillings should be smoothed off, contact points inspected and traumatic occlusion corrected. The patient is taught how to brush the teeth so that they will be clean and the gingivae stimulated. He must be made to realize the importance of this daily care. Brushing is best done with a stiff bristle brush of small size, the ends of the bristles being forced into the interproximal spaces to clean them and, at the same time, stimulate the septal gingivae. This

should be done at least twice daily and for several minutes each time.

### LEUKOPLAKIA

Another pathologic condition that should be noted when present is leukoplakia, a condition which is more common than is generally thought. The dentist, no matter what branch he may practice, should recognize this condition early. It usually occurs in middle age and is characterized in the early stages by a pearly white glistening patch or patches on the mucous membrane of the cheeks, palate or tongue. As the disease progresses, these patches thicken, harden and become hornified, presenting a leathery feel when palpated. The mouth often has the appearance of having been burned with phenol. There is no pain or discomfort; and, unless recognized by the dentist, the disease may progress until the patches crack and ulcerate and become a real menace to the health of the patient. It rarely occurs in the mouth of the person who does not use tobacco. When this condition develops, no time should be wasted in informing the patient that the use of tobacco and all other irritating substances must be discontinued. The case should be kept under careful observation as a certain percentage of cases, if allowed to go untreated, eventually become malignant.

### CONCLUSION

All of these diseases of the periodontium can, in the large majority of instances, be prevented. As dentists we are responsible for the health of the oral cavity of our patients. In the fulfilment of this responsibility, it is not enough that only the teeth be regarded as of interest. The periodontium, or supporting structures of the teeth, must be given equal attention. In the conscientious practice of dentistry, the oral cavity must be considered in its entirety and efforts must be directed toward prevention of disease rather than correction.

When a patient comes in for examination, a thorough inspection of the entire mouth should be made. All cavities should be noted and the soft tissues carefully examined for any change from the normal in color or appearance. The soft tissues are the gums, buccal mucous membrane, tongue, palate, lips, etc. At the first sign of abnormality, the etiology should be most carefully studied and steps immediately taken to correct the condition. By the removal of all etiologic factors in the incipient stage, most all diseases of the periodontium can be prevented.

The prevention and treatment of periodontal disease is the business of the entire dental profession and must not be left to the handful of periodontists. The lay public are being educated to "see the dentist twice a year," and it is the general practitioner who must assume responsibility for the maintenance of oral health, for he is the one to whom the patient goes for this periodic examination.

When disease is discovered and the general practitioner feels that he is not capable of handling, or does not care to assume the responsibility for the successful handling of, the condition, he should not hesitate to refer the patient to the proper specialist. The patient's confidence will not be lost because of this; on the contrary, he will feel that a personal interest is being taken in his case, which he will appreciate. Only when the case has been neglected and the patient has not been properly informed or the proper treatment has not been instituted is resentment felt, and justly so.

Again let me emphasize the importance of early recognition of those conditions that are known to produce periodontal disease and to repeat that most, if not all, diseases of the periodontium can be prevented.

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# *Editorials*

## THEY GO—THEY COME

If one cares to examine the periodic dental literature of twenty-five years ago and compare it with that of today, one will be impressed with several things. First will be the change in the personnel of the writers. Twenty-five years is a mere fraction of time, yet it brings about many changes, and this seems to be especially noticeable in the case of contributors to professional journals.

A roster of the names of those who were doing most of the writing twenty-five years ago will reveal very few of those who are writing today. Occasionally, the list overlaps and we find the names duplicated, but not to any appreciable extent.

In one way, this is most encouraging. It is an indication of the fact that new writers are appearing all the while to take the places

of those who in the course of nature are dropping off. If we did not have the "raw recruits" coming in, our staff of writers would soon be depleted and we would lack for material to fill our pages. Let us therefore encourage our young writers by giving them the right hand of fellowship and training them to write good literature. And just here is the rub.

To produce good literature, they need training. Every editor knows only too well that there are many members of the profession who are itching to write without apparently the willingness or ability to properly prepare themselves for the task. Too much of our literature is ill prepared, and while this may be said of most of the periodic output of the day, it should not be permitted to apply to professional journalism. This above all should be couched in language of the most meticulous style as coming from those who are supposed to be educated above the ordinary. We are aware that classical language is not easily produced. It requires painstaking care. Yet the remotest thing in the minds of many of our contributors to dental journals is the idea that they need special training in the art of writing before they essay to commit their scientific ideas to print.

A comparison of the literature of twenty-five years ago with that of today will, we think, show a general improvement in the character of our published output as the years go on. Yet a significant fact stands out most vividly: Certain of the papers presented in the early days compare most favorably with the best that is written today. In fact, it is rare in these latter times to encounter papers of the same classical perfection that a few of the older writers invariably produced. This is merely equal to saying that some of the so-called "old timers" were educated men of the highest degree of culture and attainment. The pity is that such men are doomed, in common with the rest of mankind to "go the way of all flesh," and thus it is only a matter of time when the profession is deprived of their wholesome influence. In other words, they go.

One encouraging feature of the present situation is the fact that there never was a time in the history of dentistry when such a variety of material was being submitted for publication as there is today. The fact that so much of it is immature and not available for pub-

lication need not discourage us too much. The impulse to write is a hopeful indication in any profession, and it should not be unduly curbed.

The great plea should be that our younger members apply themselves more seriously to the task of preparing themselves so that when they evolve an idea, they may be able to express it clearly and interpret it to others.

In this view of the case, we have much for which we may be thankful. The future of dental literature is secure as long as we have an adequate influx of new writers who have the impulse and the determination to write. This seems to be the case at the present time, so that we may comfort ourselves with the reflection that while the standbys of the day must inevitably go, the ranks are quickly repaired by those who are eager to fill in the breach. In other words they go, and fortunately, they come.

## AGAIN THE CHRISTMAS SEALS

At this writing, it is impossible to tell the exact amount that has come to the Central Office from the Christmas Seals, but it promises to be well in advance of previous years. Possibly the improved economic prospects of the country in general have something to do with it, or it may be a combination of several circumstances. There seems to be less opposition to the Relief plan as a whole on the part of the very few who have for some reason opposed it from the beginning, and this favorable change in sentiment is in large measure due to the efficiency with which our relief agencies have administered this matter as well as the cordial encouragement of our officers. A year ago, we commented on the very satisfactory manner in which our Relief bodies had functioned, and, as time goes on, we are more and more impressed with this fact. In no activity of the Association has there been less criticism in any of the major enterprises of the organization than in the matter of Relief, and manifestly this must of necessity have a salutary effect on the membership as a whole.

Even among those who have in no way been the beneficiaries of this fund, there seems to be a vital interest in the movement.

In response to the distribution of seals this year, some are writing in as follows: "Please send me in another hundred Christmas Seals. Enclosed find check to cover this order for Seals, also for the two hundred Seals previously sent me."

One man writes: "I am returning the Seals this year, the first time I have felt compelled to do so. I am 78 today and in July I was forced on account of foot disease to lose both my legs above the knees, which makes me almost helpless." Many pathetic cases that the profession generally never dreams of are in this way uncovered through the medium of the Seals.

Others write: "With greatest pleasure and honor I contribute to such a worthy cause. Keep up the good work, and God bless you." "I have not taken a step without pain or a cane for four years, but I am glad I can help a little. Keep up the good work." "I would gladly make it much more if I could," etc. These are typical of many of the letters, some of which are sufficiently pathetic. Letters are also received with contributions from the widows of deceased members.

There is a great deal of human nature filtering through these letters, the dominant note of which is one of sympathy and helpfulness. It is doubtful that any other activity of the Association reaches the sympathies of the members as does this one. Especially since the depression hit the country, the heart strings are pulled a little tighter, and we are brought face to face with the acuteness of the interrelationship that exists among men. At every turn of this Relief enterprise, we are impressed with the fact that no man is a law unto himself and no man can live by himself.

By the time that the present issue of THE JOURNAL comes out, Christmas will have gone with all of its wealth of sentiment and good cheer. New Year will be on us and with it the promise of what may be in store for us in the next twelve months. No one can tell, no one can even guess, but one thing above all others is certain: we need a broader sympathy for those who are afflicted and a greater consecration to the principles of elemental and eternal right.

## THE ABOMINATION AND THE BLESSING OF THE SMALL TAXES

Everyone acknowledges the nuisance of the per cent taxation that prevails everywhere. A citizen cannot go into a restaurant and order the simplest meal without being subjected to the petty tyranny of splitting the change into pennies. It cheapens the values of life immeasurably and tends to make individuals small minded. The magnification of the penny is not wholesome or elevating in an economic or any other way. To be taxed at every turn tends to irritation after awhile, and irritation leads to resentment. It is akin to repeatedly touching the same raw spot.

The principle of taxation may be a necessary concomitant of our social order, but it can easily be made a medium of such wilful and unjust oppression that eventually the people rebel; and if this rebellion becomes strong enough, the collection of taxes may some day not be an easy matter. The prevalent practice of the past and present, of "stand and deliver" on the part of our taxing bodies, may strike a snag and a most unfortunate situation may arise.

It would be little short of a calamity for an open rupture to occur between the tax collector and the tax payer, for the manifest reason that, as our present civilization is organized, a certain amount of taxation is necessary and inevitable. But evidence is not lacking in many quarters that the taxing bodies have so lost all sense of proportion and have become so obsessed with the greed of acquisition that their methods have become too oppressive to be longer tolerated without protest, and unless they see the handwriting on the wall and govern themselves accordingly, it is difficult to predict what may happen.

But there is one angle to the present sales tax levy that must commend itself as being more just and equitable than are most taxes. It comes nearer treating everybody alike than do most methods of taxation, and brought to its basic analysis, it is a virtual slap in the face for those clamorous protagonists who have been so vociferous in their advocacy of "soaking the rich." Unjust taxation is unjust taxation whether it be levied against the poor man or the millionaire, and the principle of treating every one alike is a most salutary one.

Instead of fostering the idea that because a man is improvident and therefore has not accumulated any substance, he shall be permitted to freely enjoy the blessings of government without making any sacrifice whatever to help maintain the government, he should be made to assume his just obligation to government, small though this obligation may be. To do other than this is wrong in principle and demoralizing in practice. Certain of our systems of taxation merely result in putting a premium on laziness, and this splendid nation of ours was not built up by laziness.

True it is that in our common humanity, and in loving kindness, we should "temper the wind to the shorn lamb," and nowhere in our economic scheme should we foster the "pound of flesh" policy, in our dealings either with individuals or with government.

The sales tax, while not in every way perfectly equitable, at least tends to tie the individual obligation up to government, and this means every individual who deals in commodities, large or small. The sooner we foster in the minds of every individual who has reached the age of accountability the idea that he has certain obligations to the government that protects him, the better it will be for every one. The simple fact is that too few of our citizens study their rightful connection with government, and in no relationship with the government is the issue more acute or confused at the present time than in connection with the subject of taxation.

On the one hand, every responsible individual should be glad to lend legitimate help to support the government; on the other, no individual should be subjected to unjust or oppressive taxation beyond the recognized needs of government maintenance. When taxation goes beyond that, it invariably results in governmental extravagance, waste or something worse than that.

But the one outstanding blessing of the present situation is this: On account of the continued petty taxation, everybody is talking about taxes, and it may not be long before the people begin to make some pointed observations, and ask some pointed questions, as to what becomes of all the taxes. When such an enquiry becomes really effective, there is a strong likelihood that something will crack.

## PRACTICE IN PARAGRAPHS

*This department is intended for busy readers. It aims to tell a vivid story in a few words. Items should be of a practical character, and free from padding—not more than a paragraph or two. We exact no limit, but two hundred words can tell most of these stories. Send in your ideas; they will be welcome.*

**To Prevent Dropping Tooth During Grinding**—When grinding "diatoric" teeth at the lathe, slipping a piece of binding wire through the holes will prevent dropping the tooth.—*Edward T. Evans, Decatur, Ill.*

**Easy Removal of Casts from Articulator**—Before mounting, paraffin allowed to flow on the back of the cast covering all the surface except about a quarter of an inch around the margin. The cast can then be removed easily without danger of breaking.—*H. W. Marxmiller, Decatur, Ill.*

**Tissue Massage Following Infiltration Anesthesia**—After infiltration for anesthesia, the tissues are gently massaged in the area of injection for one minute or more, to reduce tissue traumatization and to increase osmosis. Many cases of dry socket are avoided in this manner.—*G. A. Linck, Ft. Lyon, Colo.*

**Coloring Cements**—Cements can be procured in a variety of colors by the addition of small amounts of the various colors found in Steele's superstains. By mixing the cement powder with water and adding any one of the colors in the superstains to a creamy consistency, when the tooth is tried in the mouth, the proper shade of the cement to be used can be selected.—*Irving M. Hauser, Okmulgee, Okla.*

**Removing Rust from Joints of Forceps**—One or two drops of dental engine oil are mixed with fine pumice and placed in the swivel grooves of the forceps, which are then opened and closed fifteen or twenty times. The forceps are rinsed in hot water before being placed in the sterilizer, and after being sterilized are removed and dried. No free oil will be expressed from the joints when the forceps are put to use. —*N. C. Anderson, Ft. Morgan, Colo.*

**Porcelain Jacket Crown**—A more esthetic porcelain jacket crown can be made if two sittings are required of the patient for preparation of the tooth. The tooth is reduced grossly, the preparation being carried out almost to the normal gingiva at the first sitting. Before the patient is dismissed, the partially prepared tooth is phenolized carefully and a crown form is fitted thereto, filled with guttapercha or a like material and adjusted in such a manner that the normal gingiva will be pushed apically 1 or 2 mm. The patient returns in twenty-four hours, at which time the preparation can be completed to from 0.5 to 1 mm. beyond the normal gingival line, so that when the crown is set, the gingiva will be restored to its normal position and there will be no visible cement line.—*R. Philip Melvin, Winston-Salem, N. C.*

**Bleaching Nails**—To remove the discoloration under the finger-nails, the tips of the fingers should be dipped in sodium perborate powder and worked under the nails. This acts as a bleach.—*Edward T. Evans, Decatur, Ill.*

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**Removing a Root**—After a root is loosened with an elevator and lies at the orifice of the socket, a mosquito haemostat is just the instrument to remove it with. The corrugated beaks will not allow it to slip and the instrument can be locked so that the grip is certain.—*A. Porter S. Sweet, Hornell, N. Y.*

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**Forgotten Lore**—In this day of rapid transit and flighty thought but otherwise general let down, much of common sense and homely truth is lost. The dentist at the chair has an opportunity, especially when he lowers the chair back to revive the patient who feels faint, to emphasize the fact that the aid of gravity may be invoked in such cases; i. e., fainting is caused by the blood leaving the brain and getting the head low, either by lying down or bending over, will resuscitate. In case of recurrent hemorrhage from tooth extraction, the procedure is to be reversed. The patient must not lie down, but sit erect and, if need be, take a hot foot bath (in addition to placing a compress over the socket).—*W. H. Savage, Clifton Forge, Va.*

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**Mandibular Injection**—The mouth should be kept as wide open as possible; which will make the tissues, where the needle is to be inserted, so tense that the needle will hardly be felt. Also, as the internal oblique line is palpated with the index finger, the third finger is pressed hard on the outside of the neck, just posterior to the outer edge of the ramus, at the same height as the insertion of the needle. The pressure in this manner, in the direction opposite to the needle, will offset the feeling and fear that patients have of the needle's going too deep. If the dentist has someone try this injection on him, with and without this procedure, he will appreciate the difference. Injection is made on the left side with the left hand, as, otherwise, this is not practical on that side.—*J. Leo Epstein, 481 73rd St., Brooklyn, N. Y.*

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**Stone Vs. Steel**—While modern living is playing havoc with human teeth, nature keeps right on making lower molar occlusal surfaces to order for gold foil. Cavity forming wet stones run cooler and cut faster, and steel burs do only the work that stones leave. Featheredge wet stones and broken fissure burs cut undercuts quickly and well, undercuts retaining the filling, while starting or convenience points serve for starting only. Interior cavity roughness is more retentive than a smoother preparation. Following a No. 1 round bur with a wheel bur makes an "anti-balling" starting point for one or two cylinders of unannealed cohesive foil. This necessitates no holding instrument, leaving one hand free for emergencies. The unannealed cylinders are followed with others annealed to a bright red. Condenser points must never be removed from any kind of condensing device. Gold foil is sympathetic to freshly made, deeply serrated condensing points, the serrations being made by a jeweler's file. Four automatic mallets, an engine mallet and a right angle electric mallet with no changing of points make for pleasure, progress and profit. Finishing with a coarse stone that cuts rather than fine stones that burnish and slide over, together with other time saving adjuncts, cuts the completion time in half, or from one hour to thirty minutes. This is in defense of the contention that the gold foil art "takes too long."—*Herbert Ely Williams, Red Bank, N. J.*

# COUNCIL ON DENTAL THERAPEUTICS

## ACCEPTED DENTAL REMEDIES

The following articles have been accepted as conforming to the rules of the Council on Dental Therapeutics of the American Dental Association. The Council wishes dentists to understand that the admission of an article does not imply a recommendation. A copy of the rules that govern the Council in the consideration of articles will be sent on request.

SAMUEL M. GORDON, *Secretary.*

### ARSENIC COMPOUNDS*

**Arsphenamine, Squibb.**—A brand of arsphenamine, U.S.P.

Manufactured by E. R. Squibb & Sons, New York City. No U. S. patents or trademarks.

*Arsphenamine Squibb, 0.1 gm. ampuls*
*Arsphenamine Squibb, 0.2 gm. ampuls*
*Arsphenamine Squibb, 0.3 gm. ampuls*
*Arsphenamine Squibb, 0.4 gm. ampuls*
*Arsphenamine Squibb, 0.5 gm. ampuls*
*Arsphenamine Squibb, 0.6 gm. ampuls*

**Neoarsphenamine, Squibb.**—A brand of neoarsphenamine, U.S.P.

Manufactured by E. R. Squibb & Sons, New York City. U. S. Patent reissue No. 13,848, Dec. 15, 1914, expired.

*Neoarsphenamine Squibb, 0.15 gm. ampuls*
*Neoarsphenamine Squibb, 0.30 gm. ampuls*
*Neoarsphenamine Squibb, 0.45 gm. ampuls*
*Neoarsphenamine Squibb, 0.60 gm. ampuls*
*Neoarsphenamine Squibb, 0.75 gm. ampuls*
*Neoarsphenamine Squibb, 0.90 gm. ampuls*
*Neoarsphenamine Squibb, 3.00 gm. ampuls*
*Neoarsphenamine Squibb, 4.50 gm. ampuls*
*Neoarsphenamine Squibb, 0.15 gm. ampuls with sterile double distilled water, 10 c.c. ampul*
*Neoarsphenamine Squibb, 0.30 gm. ampuls with sterile double distilled water, 10 c.c. ampul*
*Neoarsphenamine Squibb, 0.45 gm. ampuls with sterile double distilled water, 10 c.c. ampul*
*Neoarsphenamine Squibb, 0.60 gm. ampuls with sterile double distilled water, 10 c.c. ampul*
*Neoarsphenamine Squibb, 0.75 gm. ampuls with sterile double distilled water, 10 c.c. ampul*

**Sulfarsphenamine.—Sulfarsphenamina.**—The salt, disodium 3,3′-diamino-4,4′-dihydroxyarsenobenzene-N-dimethylenesulfonate, $NaOSO_2CH_2NH.OH.C_6H_2.As:As.C_6H_2OH.NH.CH_2.O_2SONa$, with inert salt. Sulfarsphenamine contains not less than 19 per cent of arsenic (As). According to claims, it differs from neoarsphenamine in having two side chains instead of one, and in that the sulfur has a valence of four (with an extra oxygen atom) and not two as in neoarsphenamine.

ACTIONS AND USES: The actions and uses of sulfarsphenamine are essentially those of neoarsphenamine. It is probably somewhat more stable in solution in the presence of air. It may be used for intramuscular injection. There seems to be a high percentage of undesirable reactions to the use of sulfarsphenamine than from other arsenicals employed in the treatment of syphilis. Its use in dentistry, like that of other arsenicals, appears to be limited to its local application

*Accepted Dental Remedies, 1935, p. 50.

in the treatment of Vincent's infection and other diseases of the mouth associated with spirochetes.

DOSAGE: The maximum dosage by any route should probably not exceed 0.4 gm. or, at most, 0.5 gm. It is applied locally either in aqueous or, preferably, in glycerin solutions. It is generally used in strengths of 2 per cent, but strengths up to 6 per cent may be used.

**Sulpharsphenamine-Squibb.**—A brand of sulfarsphenamine-N.N.R.

Manufactured by E. R. Squibb & Sons, New York City, under U. S. patent 1,024,993 (April 30, 1912, expired) by license of the Chemical Foundation, Inc.

*Sulfarsphenamine-Squibb, 0.1 gm. ampuls*
*Sulfarsphenamine-Squibb, 0.2 gm. ampuls*
*Sulfarsphenamine-Squibb, 0.3 gm. ampuls*
*Sulfarsphenamine-Squibb, 0.4 gm. ampuls*
*Sulfarsphenamine-Squibb, 0.5 gm. ampuls*
*Sulfarsphenamine-Squibb, 0.6 gm. ampuls*
*Sulfarsphenamine-Squibb, 0.9 gm. ampuls*
*Sulfarsphenamine-Squibb, 3.0 gm. ampuls*

### CHLORAMINE PREPARATIONS*

**Chloramine-T Squibb.**—A brand of Chloramine-T, U.S.P.

Manufactured by E. R. Squibb & Sons, New York, N. Y. No. U. S. patents or trademarks.

*Chloramine-T Tablets, 4.6 grains:* One tablet dissolved in 1 fluid ounce of water will yield a 1 per cent solution for local application.

## NOVALDIN—NOT ACCEPTABLE FOR A.D.R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Consideration of Novaldin was undertaken because of inquiries concerning it coming to the Council and because the product has been exhibited at dental meetings and is being exploited before the dental profession. The manufacturer of the product is the Winthrop Chemical Company, Inc., New York City, which was requested to supply information concerning the product. The secretary sent to the referee an advertising circular, a small specimen of the product and a copy of the description of the product received from the manufacturer. This report is limited to the claims in the circular and separate statement of description.

Synonyms for Novaldin are stated to be Novalgin, which is a trademark for use in certain foreign countries, and Dipyrone, which is a descriptive name. The name Novaldin will be used in this report, this being the trademark used in the United States.

The chemical composition of Novaldin is claimed to be phenyldimethylpyrazolon methylaminomethane sulphonate sodium. The phenyldimethylpyrazolon portion of the molecule corresponds to the composition of antipyrine, and the second portion of the molecule, namely, methylaminomethane, brings the compound into close relationship to aminopyrine. The compound is also close in composition to melubrine which, as an antipyretic or analgesic, has not found much popularity in this country. From this, Novaldin might be expected to act pharmacologically and therapeutically like aminopyrine.

The pharmacologic actions described in the advertising circular concern themselves with the following: body temperature, circulation, respiration, and toxic and fatal doses in animals. It is claimed that Novaldin acts as antipyretic in the experimental fever of rabbits, which might be expected from the well-known actions of amidopyrine or antipyrine. The statement about intravenous toxic dosage in rabbits is not explicit. It is not clear whether the dose refers to 1 gram per kilogram of body weight or per animal, or whether the injection was slow or rapid. This large dose is stated to be without effect

*Accepted Dental Remedies, 1935, page 123.

on blood pressure and respiration; a statement which is not convincing to the referee. The fatal dose for white rats is claimed to be 4 grams per kilogram, which seems rather large, but if this is true, the toxicity of Novaldin for man might be comparatively small, although doses based on experiments on rats are not, as a rule, directly transferable to man. Fatal doses of drugs in the case of rats are generally larger than in other mammals. More important than the acute fatal dose and toxicity of such a product as Novaldin would be the effects of continued administration over long periods, since such drugs are likely to be used repeatedly. No results of such continued administration are mentioned in the circular. Since amidopyrine and antipyrine are regarded as possible factors in agranulocytosis, a careful determination of such possibilities as regards Novaldin is in order. (Since this report was adopted and sent to the firm, such a case has been reported. Benjamin and Biederman report the occurrence of a case of granulopenia from the ingestion of Novaldin. [Agranulocytic Leukopenia Induced by a Drug Related to Aminopyrine, J.A.M.A., 107:493 (Aug. 15) 1936.].) Important in this connection would be the effect of continued administration of Novaldin on the condition of the blood and viscera; nutrition and appetite, general tolerance, habituation, etc. There is no indication that attempts have been made to determine this.

The clinical claims for Novaldin stress the absence of toxicity in therapeutic doses, the absence of harmful effects and the indications for use in fever and relief of pain. As for possible injurious effects and lack of toxicity, no consideration is given to possible injuries to the blood and to tissues and functions mentioned above. Special sensitivity and idiosyncrasy to Novaldin, as in the case of antipyrine, are not mentioned. As for antipyretic actions, these are the least important with drugs of the antipyrine group, since these drugs are no longer used as antipyretics; the antipyretic action being too rapid and erratic, and, therefore, uncontrollable. This leaves only the analgesic action, which, of course, is well known for the antipyrine group, and is considerably emphasized in the therapeutic use of Novaldin.

Therapeutic usefulness is claimed in headache, neuralgia, articular rheumatism, muscular rheumatism, colds and influenza, renal colic, biliary colic, otorhinitis, tuberculosis, the pain of childbirth, pain in surgical conditions, morphine addiction and malignant disease; all of which conditions are outside the scope of dental therapeutics. Dental uses are not mentioned in the advertising circular, but such usage is indicated in the separate description sent by the manufacturer. As uses other than those of interest in dentistry have no place in advertising material for the dental profession, the inclusion of these in circulars for dentists and in advertising in dental journals is objectionable and unacceptable. Moreover, too much is suggested or advised in the way of intravenous injections of Novaldin, in the advertising circular, and this in the face of the safeness of the drug stressed in the same circular. The exploitation of intravenous injection of agents which can be used just as effectively by mouth is not countenanced by the Council. Therefore, the advertising of ampuls for intravenous injection is objected to by the referee. Objection is also made to the inclusion of "symptomatic relief of pain in general headache, neuralgia, rheumatism, and similar painful conditions" in the separate statement of descriptions and claims submitted by the manufacturer, for the reasons stated above. The referee believes that Novaldin is a superfluous and unnecessary product for the therapeutic armamentarium, in view of the fact that it resembles so closely antipyrine and amidopyrine, without obvious advantages over these official products. Moreover, its usefulness in dentistry is not established by clinical or experimental evidence.

In view of the foregoing, Novaldin is declared not acceptable for A.D.R.; i.e., because the claims for its usefulness are not established, the advertising claims are misleading and unacceptable, especially since the potential harmfulness of continued administration is not mentioned, and it has no advantage over antipyrine and amidopyrine, which are official in the United States Pharmacopeia, and are described in A.D.R.

# WORCESTER SALT TOOTH PASTE—NOT ACCEPTABLE FOR ACCEPTED DENTAL REMEDIES

Worcester Salt Tooth Paste was the subject of a report by the Council in the early part of 1935. Reference to the report which follows indicates the type of information used in promoting the product. Publication of the report was withheld because of the professed intentions of the firm to advertise the product in an acceptable manner; and advertising to that effect was presented, although the firm has taken no steps to make the product otherwise acceptable to the Council.

Recently, there came to the attention of the Council advertising for the product in the October, 1936, issue of *The New York Journal of Dentistry*. The following statements, previously made in advertising the product and discussed in the report of the Council, appear in this advertising:

The base of this paste is specially powdered pure Worcester Salt, smooth as silk—plus antacids, and a small amount of pure soap in a delightfully flavored base. It removes mucin deposits; it mildly stimulates the gum tissue, and leaves a delightfully refreshing aftertaste.

Essentially the same claims are made on tubes of the product.

A review of the literature indicates that no special emphasis can be placed on the value of salt as a dentifrice. It continues to be advertised as an antacid and as a remover of mucin deposits and a gum stimulant, despite the fact that, as the Council points out in its report below, there is no evidence to justify these statements. The Council reaffirms its position that all a dentifrice can be expected to do is aid the toothbrush in cleaning the surfaces of the teeth, and emphasis in other directions, in the absence of pointed evidence, is not in the interest of the profession or the public.

The Council therefore reaffirmed its previous recommendation regarding publication of the report. This report is presented for the information of the profession.

SAMUEL M. GORDON, *Secretary.*

Worcester Salt Tooth Paste is another addition to the growing list of dentifrices. According to a testimonial, it is "A product which the profession has long been waiting for. . . ." It is also claimed to be "used and recommended by famous dental clinics."

It is advertised with the following claims:

1. It cleans teeth thoroughly.
2. It stimulates the circulation of the gums; it helps make them firm; and it helps heal tender, bleeding gums.
3. It brings out the natural lustre of the teeth by coagulating film deposits so your toothbrush can remove them easily.
4. It is safe—no gritty substance to injure the teeth—no caustics to injure the gums.
5. Its mildly antiseptic qualities purify the breath.
6. It stimulates the flow of saliva and so helps your mouth keep itself clean and wholesome.
7. It neutralizes mouth acids quickly and so helps prevent these acids from harming the enamel of your teeth.

In advertising, which is enclosed in the carton, there appears the following:

STIMULATES CIRCULATION IN GUMS

Worcester Salt Toothpaste stimulates the gums. It aids in giving them natural color and firmness. Soft gums are more easily infected, hence the desirability of using Worcester Salt Toothpaste constantly.

TOOTH AND GUM INSURANCE

Here at last is a toothpaste that is a detector of tooth cavities, pyorrhea and gum disorders. If any of these ailments exist they become immediately apparent to the user of Worcester Salt Toothpaste . . .

Of these claims, only the first and the fourth may be considered as a basis of acceptability. The remainder go beyond legitimate claims for a dentifrice. They are therefore discussed below.

Patent 1,968,858 (Aug. 7, 1934) was issued by the U. S. Patent Office to W. K. Sheffield and Charles H. Dickson, and assigned to the Worcester Salt Company. The following recipe appears in that patent:

| | |
|---|---|
| C. P. glycerine | 37½ pounds |
| Neutral soap | 1½ pounds |
| Gum tragacanth | 1½ pounds |
| Magnesium carbonate (finely divided) | 13 pounds |
| Calcium carbonate (finely divided) | 51½ pounds |
| Milk of magnesia (magnesium hydroxide) | 31 pounds |
| Distilled water | 24 pints |
| Saccharine powder | 282 grains |
| Salt (finely divided) | 108 pounds |

Examination of the product in the A.D.A. Bureau of Chemistry revealed the following:

| | |
|---|---|
| Salt | 40 per cent |
| Calcium carbonate | 19 per cent |
| Glycerin | 16 per cent |
| Magnesium compounds [as $Mg(OH)_2$] | 4.4 per cent |
| Water | 18.1 per cent |
| Fatty acid | 0.5 per cent |
| Essential Oils and other undetermined | 2 per cent |

The concordance of the results of the chemical examination with the foregoing recipe indicates that the sample examined was made according to that recipe. Tubes of the product observed some time after purchase were markedly corroded in such manner that the paste oozed through the "pinhole spots." Subsequently, the firm advised that the salt content was reduced to 30 per cent, that their tubes are made of pure block tin and that they have overcome the corrosion mentioned above.

There is no adequate evidence available that Worcester Salt Tooth Paste ". . . stimulates the circulation of the gums; it helps make them firm; and it helps heal tender, bleeding gums." No evidence is available that massaging the gums with a tooth paste in disease is more effective than massaging of the gums with the fingers or a toothbrush alone. A toothpaste is not necessary for this purpose. The Council is in agreement with the position expressed by the American Academy of Periodontology that the toothbrush and not the dentifrice is the important factor in massaging the gums. The admonition that Worcester Salt Tooth Paste should be used constantly because "soft gums are more easily infected" is an unwarranted claim for the use of salt in disease which may have "soft gums" as one of its symptoms.

A dilute salt solution partially removes a smear of *gastric mucin* from a glass slide; but this simple experiment cannot be taken as evidence that a tooth paste capable of removing such a smear would be effective in keeping the teeth free of "film." There is nothing appearing either in the patent or in the chemical examination of Worcester Salt Tooth Paste which may be considered as an agent that will keep the teeth free of "film" or other supposed plaques. The Council has pointed out that "film" as used in dentifrice advertising is a term the use of which has no logical basis. Until more is learned about "film" or "plaque" by careful dental investigation, the term may be considered to be used to impose on the credulity of the uninformed. The position of the Council on film has been discussed in the report holding Pepsodent Tooth Paste not acceptable for Accepted Dental Remedies. (J.A.D.A., 21:1688 [Sept.] 1934.)

The contention that Worcester Salt Tooth Paste has antiseptic properties is not in accord with the known actions of salt. Salt is generally not considered as an antiseptic

agent unless used in solutions approaching the strength of brine. Even if Worcester Salt Tooth Paste possessed antiseptic action in the test tube or under artificial test systems, in the concentrations used in the mouth, this fact would be of no significance as far as the hygiene of the mouth is concerned, since it is known that the mouth cannot be made sterile or aseptic nor can the number of bacteria be reduced materially. Furthermore, no critical evidence for the desirability of lessening the "bacteria count" of the normal human mouth is available to the Council.

The claim that Worcester Salt Tooth Paste stimulates the flow of saliva may be true, but it is undoubtedly a defense reaction to the introduction of an irritant in the mouth. In any event, the volume of salivary flow cannot be appreciably altered by putting salt and alkaline magnesium compounds in the mouth several times a day.

The claim that Worcester Salt Tooth Paste neutralizes mouth acids quickly and so helps prevent these acids from harming the enamel of the teeth is, in the light of known knowledge, scientifically false. It has been demonstrated repeatedly that the acidity or the alkalinity of the saliva cannot be materially altered by the presence of introduced substances. Furthermore, saliva is a buffered medium. As far as acceptable clinical conditions go, the term "mouth acids" has no real significance.

More pernicious is the claim in circular advertising that

> Here at last is a toothpaste that is a detector of tooth cavities, pyorrhea, and gum disorders. If any of these ailments exist they become immediately apparent to the user of Worcester Salt Tooth Paste . . .

If this is really so, Worcester Salt Tooth Paste is endowed with an intelligence beyond the skill of the dental profession. Careful inspections are necessary to detect incipient cavities, pyorrhea or other gum disorders. Will Worcester Salt Tooth Paste detect the manifestations of agranulocytic angina, stomatitis medicamentosa and noma? to mention only a few "gum disorders." How is the uninformed user to whom the advertising is addressed to differentiate a serious from an insignificant "gum disorder"? There is nothing known to dental science about the properties of salt which endows it with such discrimination. This is carrying a mixture of salt and chalk too far, and should indicate to dentists the necessity for frowning on this kind of sales appeal if they are to guard their patients' interests.

The following may be quoted as summarizing the definite information on the uses of salt in dentifrices:

> Sodium chloride is used alone or mixed with chalk and other materials as a dentifrice. Caution should be exercised in dispensing sodium chloride dentifrices (containing water) in tin tubes, because of the corrosive action of sodium chloride on tin. The feeling of stimulation claimed to be produced is probably due to the mild irritant properties of the salt or the salt solution on the mucous membranes. Although common salt has been advocated as a useful dentifrice, there is no adequate evidence either clinical or laboratory, upon which this advocacy is based. In substance, it represents an economical dentifrice.—Accepted Dental Remedies, 1934, p. 156.

The Council grants that an acceptable dentifrice may be desirable as an aid to the toothbrush in cleaning the *surfaces of the teeth*. The use of both, within their limitations, is recognized by the Council as an aid in the every-day hygiene of the mouth. Their proper use, by developing habits of cleanliness, may aid in removing loose food débris, and, in this way, may be a hygienic factor of value. Advertising thaumaturgy, which attempts to make a tooth paste or tooth powder more, trades on the credulity of readers.

It thus appears that the vendors of Worcester Salt Tooth Paste have adopted the usual technic of exaggeration and pseudoscience of most of the national advertising dentifrice industry and claim for what may be no more than a cleansing agent, preventive and therapeutic properties. In doing so, its advertising copy-writers have fished in the murky waters of advertising dental "science" to build up a story for their product. Most na-

tional dentifrice advertising attempts to make the people conscious of mouth diseases and conditions which they do not possess. Advertising can make a tooth paste no more than it is, an aid to the toothbrush in cleansing the surfaces of the teeth.

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## LARODON "ROCHE"—NOT ACCEPTABLE FOR A.D.R.

The Council has authorized publication of the following report.

SAMUEL M. GORDON, *Secretary.*

Larodon is marketed by Hoffman LaRoche, Inc., Nutley, N. J. It has not been submitted to the Council, but it is advertised in dental journals, and samples are being distributed to the dental profession. Inquiries concerning it resulted in requests by the secretary for information about its composition, actions and uses. The following quotations from the manufacturer's letters will indicate the general status of the product.

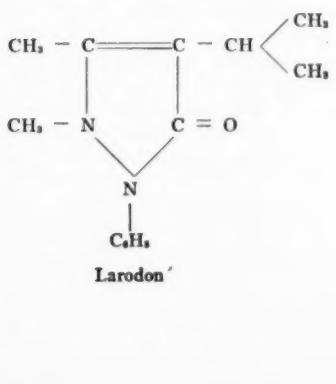
Larodon, as you doubtless know, has been made available commercially only within the past few weeks. This introduction was preceded by a period of investigation of at least two years' duration in which extensive pharmacological and clinical studies were made. We had it in mind first of all to allow sufficient time to elapse for the publication of data resulting from the clinical studies.

In the meantime, if there are any specific questions which you would like to ask concerning the constitution or the properties of Larodon, we should be very glad to place the information at your disposal. . . . (Letter of November 4, 1935.)

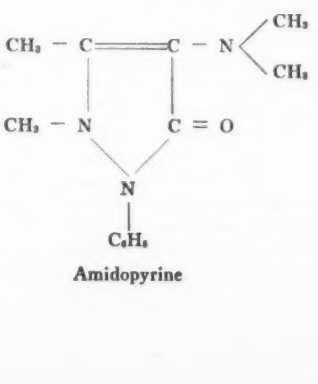
In answer to your inquiry of November 18th concerning Larodon "Roche," we think it might be best to send you the enclosed copy of a letter which we just forwarded to the Council on Pharmacy and Chemistry of the American Medical Association. We trust that this letter will give you the desired information as regards the present status of Larodon, and the data contained therein will enable you to answer any inquiries about the remedy which you may receive from members of the dental profession.

As stated in our letter to the A.M.A. Council, trial supplies of Larodon were given to a number of physicians and dentists who are reporting favorably on its therapeutic value. . . . (Letter of December 9, 1935.)

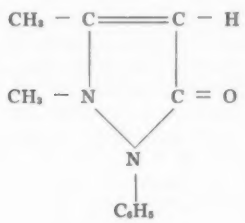
This letter states that Larodon, chemically, is 1-phenyl-2, 3-dimethyl-4-isopropyl-pyrazolon, and presents a structural formula. It is stated that Larodon is a finely crystalline, white powder which has a slightly bitter taste, with a low solubility in water, but ready solubility in alcohol or ether. This meager description does not indicate whether the product as sold is a definite, single entity. The relationship of Larodon to antipyrine and amidopyrine may be seen from the following structural formulas:




Larodon




Amidopyrine



Antipyrine

Accordingly, the pharmacologic actions may be expected to be similar to those of antipyrine. The manufacturer's information is extremely limited and unsatisfactory. The following statements in the firm's letter of December 9, 1935, indicate not more than promises:

The new compound had been under investigation in Europe in medical and dental clinics for several years (since 1932) and was found to exert a definite analgesic-antipyretic action. On the strength of the clinical reports, it was decided to introduce the remedy to the profession in this country. Before doing so, we gave, about a year prior to the first announcement, trial supplies of Larodon to a number of important clinicians and dentists. Reports received from these also speak very favorably of the therapeutic action of the compound. It is expected that some clinical reports on Larodon will soon appear in the American literature and it is our intention to forward to the Council such clinical material with the usual technical information required in the presentation of a new remedy.

Larodon "Roche" is a one-drug remedy and is distributed in tablets, 5 grains each. For prescription writing the substance is available also in powder form in 1-ounce packages. . . . (Letter, December 9, 1935.)

Previous to the date of this letter, the firm was advised that the Council assumes that the clinical work is reasonably complete before the product is advertised to the profession, if the interest of the public, the dentist and the manufacturer is to be fully conserved. Nevertheless, the product continues to be advertised to dentists with claims that are unduly optimistic, considering the paucity of information available.

Decidedly less conservative are the manufacturer's claims in advertisements in *Oral Hygiene* (January, 1936) and *The Dental Cosmos* (December, 1935). For instance, *Oral Hygiene* for January, 1936, contains the following statements:

An entirely new analgesic by Roche. Larodon is the outcome of chemical, pharmacological and clinical research undertaken and perfected by Roche scientists in answer to the many requests from dentists for a new analgesic, an analgesic that can be depended upon for quicker action without sacrifice of safety. Toothache. Neuralgia. Post-extraction pain. Pain following dental work. Prescribe Larodon—one or two tablets—for relief in any of these conditions. The results will be both gratifying and surprising. Usually only a few minutes will elapse and then the mask of pain will be lifted from the patient's countenance.

In *The Dental Cosmos*, the following claims appear:

For that oft-recurring triad, pain, fever, malaise. A new remedy Larodon. Larodon is the most recent product of Roche research. This new substance has been thoroughly tested pharmacologically and clinically. Its superiority is unmistakable—it is safe; it is effective; it acts quickly. Try it in place of the older analgesics—see if you, too, don't think it is better than acetylsalicylic acid, amidopyrine, acetanilid or acetphenetidin. The action of Larodon is threefold. It dispells pain quickly—only a few minutes for definite relief. It reduces *febrile* temperature, but does not depress temperature to subnormal level. It overcomes malaise, giving the patient a sense of physical and mental well-being. The ordinary dose is five to ten grains, repeated as required.

From all this it would appear that the manufacturer knows a great deal about the action of Larodon, but, if he actually has such knowledge, it has not been made available to scientists for impersonal and distinterested consideration. A search of the European medical literature from 1923, and of American sources from 1931, to date, fails to disclose published reports on this product. In other words, there is not a single iota of evidence as to this drug's action. There are only the advertising claims of the manufacturer, which dentists are asked to accept on faith. Nevertheless, claims for a powerful action are made, and for an alleged superiority over other antipyretic and analgesic drugs in common use. If these claims should prove to be true, it follows that Larodon might also possess powerful undesired actions. No mention of these, or of possible dangers from its use, is made by the manufacturer, either in correspondence or in journal advertisements.

As Larodon is chemically related to antipyrine, there might be a danger of agranulocytosis from continued use over long periods, or from overdosage, especially in susceptible individuals. Antipyrine and amidopyrine are frequently incriminated as causal of this condition, and whether this is conclusively proved, it is something to be thought of, and warned against, at least, where powerful actions are claimed for a drug, as is the case of Larodon. (It is of interest to note that certain pharmaceutical houses have not hesitated to point out on labels the possibility of untoward incidents from amidopyrine.) But, the advertisements are ominously silent on this important point. In fact, they proclaim a certain safeness for the drug. Although Larodon is claimed to be a "one-drug remedy," it does not follow that it would possess only one action, but on the contrary, there might be multiple actions, and some of these undesirable, resulting in such conditions as agranulocytosis, collapse and habituation.

It seems quite clear that the manufacturer's claims for Larodon are vague, indefinite, and uninformative. They appear to capitalize the credulity of those unacquainted with chemical complexes and names. Probably not all dentists will believe that Larodon is "an entirely new analgesic," . . . at least not pharmacologically.

The Council concurs in the opinion of the referee that the advertising of Larodon is premature. The claims for its superiority over well-known and tried analgesics, and of its safeness, may be exaggerated and misleading. The dental profession would be well-advised to refrain from the use and prescribing of this drug until evidence of its usefulness and safety are made available from the manufacturer and verified from disinterested sources, and the Council's judgment on the validity of the claims is obtained.

# BUREAU OF PUBLIC RELATIONS

## CHANGING THE COURSE OF HUMAN LIVES

By NATHANIEL G. SLAUGHTER, D.D.S., Athens, Ga.

THE first interest in dental health for school children in Athens, Ga., was taken about twenty-five years ago when I was requested to examine the mouths of the children in the elementary training school at the state normal school and make a report of my findings to the parents and teachers at a subsequent meeting. It was then that the value of mouth examinations and preventive dentistry was suggested to them.

Much has been accomplished since those pioneer days in the prevention of pathologic oral conditions, but it was not until 1925 that, at a meeting of the Eighth District Dental Society of Georgia, Bernard W. Carey, director of the Athens Health Demonstration, one of the projects of the Commonwealth Fund of New York, consented to recommend the addition of a dental hygienist to his staff, and then on the condition that the local dentists cooperate in a dental health program. This marked the beginnings of an excellent program, and when the trained worker arrived, we all began to realize what it might mean for every child to have a perfect mouth. Recognition of the fact that 95 per cent of children need dental attention, brings also the realization that it is no ordinary task to reach each in a city with approximately 2,000 pupils in the elementary grades. There were many obstacles to be overcome. A few parents were opposed to having their children's teeth fixed. They had gotten along without the dentist and saw no reason that their children needed attention. Then there was the age-old dread of the dental office.

There were three things necessary in a project of this kind: (1) someone with a vision; (2) a spirit of cooperation, and (3) a great amount of work. We were fortunate in that we possessed all of these requisites. I do not mean to be less than modest when I say that I furnished the first. The spirit of cooperation was never quite equaled. The commissioner of health with his board and co-workers, the superintendent of schools and board of education, the parent-teacher's association and the local dentists all working together assured success in the common cause of assuring future citizens better health. If the statement made by Charles H. Mayo that 85 per cent of the infections of the body enter through the mouth is true, it is surely worth while to keep the mouth free from infections.

The question of finance is always a serious one in the promotion of public health. Every child was expected to pay for the services rendered, and, of course, Athens has its poor like every other community. The dentist, with the great goal of service to all children uppermost in mind, reduced his charges wherever the need was evident, and gave free service to children known to be indigent. At one of the schools, the handicap of small family incomes was ingeniously met by

the teachers, who organized a revolving loan fund from which the necessary costs of dental work were paid in full, after which the child's family repaid the loan little by little.

Two facts stand out prominently: This service could not have been rendered but for organized dentistry, and the city as a whole was roused to a pitch of interest in dental health which it had never before reached. Evidence of the impression made on the children was seen in one of the schools when a distinguished visitor from Oxford, England, asked what Athens was noted for. Two hands went up, and the reply was: "One hundred per cent good teeth." This fact was uppermost in the minds of the children even though Athens is the home of the University of Georgia and the Georgia State College of Agriculture, and was the home of such great Georgians as Crawford W. Long, the discoverer of anesthesia; Benjamin H. Hill, antebellum statesman, and Henry W. Grady, immortal journalist.

The 100 per cent correction in one of the schools encouraged the remaining elementary schools of the city, which were soon "over the top." This was followed by a great May Day celebration, when the Mayor of Athens received, in behalf of the city, the following engraved certificate from the Georgia State Dental Society:

> Let it be known to all men that the Georgia State Dental Society in pursuance of its high mission to promote happiness and efficiency of the people through dental health, has bestowed upon the Corporation of Athens, Georgia, this certificate of Distinguished service for the perfect work in dental health of its school children. In testimony whereof we have hereunto affixed our signature and seal this 10th day of May in the year of our Lord Nineteen Hundred Twenty-seven.
>
> (Signed) Dr. F. C. Wilson, *President;*
> Dr. G. A. Mitchell, *Secretary.*

This all happened ten years ago. What has been the result? Was it worth while? Are Athens children better off than children in other cities? A principal of one of the elementary schools writes:

> Since we have had the service of a trained oral hygienist and excellent cooperation of parents, nurses and dentists, an improvement has been made in health of the children.
>
> We rarely ever have pupils with toothache, swollen gums, etc.; consequently, they are practically free from the cross feeling and aches that follow trouble from decayed teeth and diseased gums.
>
> They can prepare lessons in less time and more satisfactorily because they are well and feel physically fit for school work.
>
> A child with a mouth in good condition is not apt to be cross and give trouble in regard to behavior during school hours and at play periods. Good teeth and bad language are not apt to go together.

The principal of the junior high school says: "We no longer have toothache drops in our emergency kit. Toothache is practically unknown."

Each year since this achievement, practically every child has been to the dentist. The mass movement has removed all fear. The pupils have learned that an unhealthy mouth is a menace to themselves, their fellow students and those in their homes. They know that an infection in the mouth is likely to jeopardize their future, that it may take from them not only health, but also change their personality. Though it is hard to realize, it is absolutely true that the saving of one tooth or the correction of a minor defect often changes the course of a human life. Prevention is not so spectacular as cure, but it gives greater satisfaction. The children are willing to undergo a little pain and some discomfort that they may reach a higher goal, build a body that can stand stress and strain and be better prepared to meet the problems which are now facing young Americans.

Let us not forget that when a health service is rendered to the youth of the country, it is, as Willis Sutton, a former president of the American Education Association, says, "The building of a civilization and a race." The service rendered in Athens can be achieved in other communities if a group of citizens are willing to consecrate themselves to this worthy cause. I have no way of proving my case, but I feel assured that Athens, is, dentally speaking, far in the lead of all other towns or cities in the world.

It is the universal opinion that in all the wide range of philanthropy, nothing is quite so important as the building of a healthy body and the developing of character. Unstinted praise is granted to the great philanthropists who have given the Eastman Dental Dispensary to Rochester, the Forsyth Infirmary to Boston, the Guggenheim Clinic to New York, and others, that children might receive the benefit of skilled dental service; but in no less measure should honor be given those who are serving without attractively equipped and highly endowed clinics.

## DENTAL RESEARCH AND ITS VALUE TO THE PUBLIC*

By P. C. LOWERY, D.D.S., F.A.C.D., Detroit, Mich.

IN comparison with other sciences, dentistry is very young. Youth, with its usual accompanying ambition, is undoubtedly the basis of the great amount of research work that dentistry has done in such a short time.

My subject, "Dental Research and Its Value to the Public" is of importance to every one within reach of my voice. As chairman of the Research Commission of the American Dental Association, it is my privilege to present this subject in behalf of the Association, which is convened at the present time for the purpose of study and the advancement of the profession in protecting the oral health of the public.

Dentistry has made rapid advancement in the past few years and American dentistry is far in the lead in world progress. The local and state dental societies have contributed much to their parent organization, the American Dental Association. Through their initial interest and their subsequent support, the Research Commission of the American Dental Association was founded in 1913, and has since been maintained. The efforts of this commission have been a distinct contribution to organized dentistry.

Research is the foundation of any science or profession. The quality of dental research reflects the progress of the profession. It is the oil that keeps the motors of dentistry running smoothly and accurately.

Horace Wells, a dentist, first used nitrous oxide anesthesia in the alleviation of pain in surgical operations, and later William T. G. Morton, also a dentist, introduced ether for the same purpose. I wonder how many of my audience realize that freedom from pain during major operations was assured by the discovery of these two anesthetics by the dental profession. This is one of the outstanding examples of overlapping of the research of dentistry and that of medicine to their

*A radio talk.

mutual benefit in rendering health service to the public.

Much credit is due these and many other early research workers in dentistry for accomplishing much under such handicaps as lack of money and of equipment. That these obstacles did retard progress is evidenced by what has been accomplished under more favorable conditions within recent years.

The care of the sick and those in pain, through all the ages, has been the index of the progress of human civilization. The dental profession has also had a leading rôle in the discovery and advancement of local anesthetics, which, too, are used for the alleviation of pain and suffering. The applicable principles of cocaine and later of procaine products were greatly improved by dental research. This work is still under observation in the research division of the American Dental Association. Unfortunately, in a few instances findings have not been announced through proper channels such as the Research Commission and our scientific journals, but were presented through the public press, as was the Hartman desensitizer several months ago. While there is value to this desensitizer, it has decided limitations. We have had and still have equally good desensitizers which dentists have been using successfully for years. The publicity given the Hartman desensitizer was both unfortunate and embarrassing and quite out of harmony with its value. It built up false hopes in the mind of the public, which, in the end, lead to doubt and disappointment.

This and similar problems are being and will continue to be the earnest concern of the Research activities of American organized dentistry. Highly trained minds, from the very nature of these problems, must act conservatively and safely.

Especially in the field of dentistry, the actual elimination of pain and the safeguarding of health is to a great extent under your own control. Delay and neglect in seeing your dentist is sure to be the cause of a more extensive, a more expensive and a less satisfactory dental restoration.

You so often hear the slogan "See your dentist twice a year." Some may go for a year or more with safety, while another should visit his dentist more frequently than twice a year, some every month, others every three months. Be guided by what your dentist deems best for the safety of your oral health. There, then, is indicated the contribution each person can and must make to the successful solution of the problem of dental health.

What is the dentist contributing to the welfare of his patients? To the welfare of the public? I can say that organized dentistry is financing a research program which has for its purpose the improvement of the service which the dentist is rendering; the improvement of methods in using dental materials; the improvement of dental materials themselves which he is using to replace teeth and tissue destroyed by the most common of all diseases to which the human flesh is heir. Of course, I refer to the decay of teeth, together with the bad after-effects on the general health, which are a direct result of such an unhealthy condition of the mouth.

Extensive work on dental materials is being conducted by fellowships of the A.D.A. and members of the federal government at the National Bureau of Standards at Washington. Standards of quality are being written for such materials, to which the dental manufacturers are very receptive. Organized dentistry has also stimulated and sponsored this work in dental schools, with the satisfactory result that several of

these schools have installed sufficient equipment and personnel to conduct courses on the physical properties of dental materials. Already decided improvement in the quality of these materials is evident; already the methods of handling them have been improved. Now, why is the dental profession financing and supporting this work? There is only one answer: the dentist prefers to use only the best materials obtainable and he desires to use them in the most intelligent manner. In other words, he is giving the best professional service that he can render and is actively supporting research which is aiding him in rendering a constantly improving service.

These findings have raised the standards of dentistry and have raised the life span of operative dentistry, particularly that of the gold inlay and amalgam restorations. This is a distinct contribution to dentistry and a decided benefit to the public.

An example of the alertness of dental research workers is evidenced by the effort made by the dental profession after the discovery that the presence of fluorine in the water supply was the cause of mottling of the enamel of teeth. As soon as this was recognized and proved, the allied sciences were brought into cooperation and steps taken for its prevention.

Organized dentistry is both sincere and generously broad in its promotion of the advancement of dental service for the public. Even though only members of this organization are financing this program, findings are placed at the disposal of all dentists. Authentic and unbiased information may be had by any dentist through this cooperative work at the Bureau of Standards whether or not he contributes to its support.

I have told you of the work organized dentistry is doing in physical research. Now I wish to discuss an equally, if not more important phase of dental research, biologic research.

In the early days, dentistry was content to use empiric knowledge of mechanics in restoring teeth that had been damaged by disease. Most dentists were little more than highly skilled artisans trained to do delicate operative and prosthetic work. But, with the appreciation that dentistry, as a profession, necessitates the greatest skill and knowledge in the arts, sciences and mechanics, this is no longer true. Modern dentistry, because of research work in anatomy, is now able to establish and maintain jaw relations so that patients can enjoy greater comfort and still maintain the facial expression and appearance after the loss of the natural teeth. In 1910, William Hunter and later, Charles H. Mayo called to the attention of the healing arts the fact that mouth infections bear a very definite relationship to general health. After this announcement, the dental profession was awakened to the fact that there was need for dental biologic research if the next step in preventive medicine was to come from the dental profession. Since 1913, organized dentistry has spent approximately $400,000 on this type of research. Much of it has been spent trying to determine the cause and means of prevention of dental caries. Research in commercial fields is carried on with the objective of creating or inventing new ideas to commercialize the product for promotion. On the other hand, the professions, especially medicine and dentistry, by their research efforts are trying to actually eliminate a large portion of the very work, the reparative work, they are called on to do. Dentistry is hopeful that the day will come when dental caries can be eliminated.

Our present attack on dental caries is well under way. A committee of three internationally known men, representing

three different professions, have been appointed as a special advisory committee on dental caries. The function of the committee is to correlate and arrange in convenient form all previous literature on dental caries. This is to include information from all allied professions, from all countries. Later, we are hopeful that the A.D.A. will finance a program whereby we may establish not less than three fellowships for work in one or more of our large research institutions on the specific problems of dental caries. These Research Associates should be selected from men trained in one or two of the following sciences: dentistry, engineering, biochemistry, bacteriology, pathology, immunology, eugenics, nutrition and metabolism.

Thus, the Research Commission of the American Dental Association believes the problem of dental caries can be met.

Lowery Building.

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## EXHIBIT OF THE SCHOOL OF DENTISTRY, WESTERN RESERVE UNIVERSITY, GREAT LAKES EXPOSITION, 1936

One of the well-patronized features of the Great Lakes Exposition held in Cleveland from June 27 to October 12 was the exhibit of Western Reserve University. Housed in a building erected by the University for the purpose, the exhibit represented the combined efforts of the thirteen schools of the University in getting together a display of material designed to appeal to the general public and at the same time indicate to some degree the relation of an educational institution to social advancement.

The exhibit of the school of dentistry proved of especial interest. A mechanically operated device illustrating tooth eruption, a list of questions to which appropriate answers were available through the turning of a crank, and a series of skulls illustrating various stages of tooth development attracted most attention.

The device illustrating tooth eruption was lent by R. H. Johnson, the designer and owner, and arranged through the courtesy of the American Dental Association. Teeth were set up in a wax cone showing six stages in eruption, the last of which was the first permanent molar. This assembly

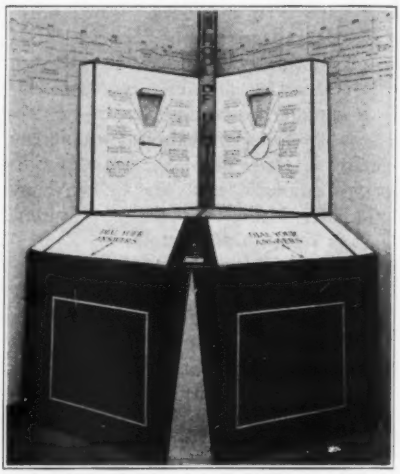


Fig. 1.—Exhibit of School of Dentistry, Western Reserve University, Great Lakes Exposition, 1936.

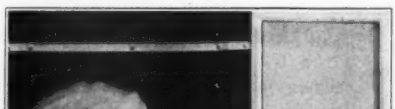


Fig. 2.—Exhibit of School of Dentistry, Western Reserve University, Great Lakes Exposition, 1936.

was placed behind the mouth of the wax face and rotated mechanically. The mechanism was so designed that each stage was presented to view for fourteen seconds. Si-

multaneously, a brief descriptive sentence appeared on the ground glass screen to the right of the wax figure.

The popularity of the question and answer device designed by the American Dental Association suggested that something similar to this might be of interest. Such a device was designed and constructed by the school of dentistry, differing in two respects from the model from which it was patterned as follows: 1. The questions were not only of an educational nature, but also dealt with entrance requirements and the curriculum of Class A dental schools. 2. The answers were printed on a revolving disk mounted behind a panel. With this arrangement, the answers appeared in the opening shown in the photograph with the printing always horizontal and illuminated by a showcase light.

The skulls illustrating various stages in the development of the teeth from the fetal period to senility were mounted with a black velvet background on a partitioned turntable. The table was motor driven so that the skulls were brought into view progressively behind the window in the center of the cabinet. The table rotated at such a speed that the complete series was shown once every two minutes. The cabinet containing the exhibit constructed by the school was designed to utilize efficiently corner space and harmonize with the modernistic environment of the exposition.

## MICKEY MOUSE MILITIAMEN

GENERAL Michael Mouse, better known as Mickey to his millions of world wide friends, has just announced his intentions to fight dental decay. The general brings with him his entire retinue of staff officers: Minnie Mouse, Clarabelle Cow, Horace Horsecollar, Donald Duck, Pluto the Pup, the three little pigs and the Goof. Already the general and his staff are busily engaged in outlining their campaign against the Big Bad Wolf. Interviewed at staff headquarters, General Mouse stated: "I have definitely decided to throw the entire strength of my forces against the Big Bad Wolf of dental decay. Decay is the enemy of children. I am a friend of children—and children are my friends. Their enemies are my enemies—their battle is my battle. With the aid of my excellent staff of well-trained officers, I propose to organize a youthful army that will rout this rascal from America," and the mighty little general's voice shook with determination.

"How did you become interested in this campaign?" the interviewer asked.

"I have always been interested in children's problems," the general replied. "Injury to them means injury to me. I am especially antagonistic toward dental decay because it is a particularly vicious enemy. It is a big bad wolf in sheep's clothing. Masquerading as a minor enemy, it hoodwinks thousands into allowing it to enter their homes. Once established, it slowly but surely plays havoc with its innocent and unsuspecting victims. I inherited my antipathy to decay from my uncle, Walt Disney. Years ago, back in 1922 or '23, Uncle Walt helped a friend of his, Dr. Thomas McCrum, make a dental health movie entitled, "Tommy Tucker's Tooth." Later, in Uncle Walt's Hollywood studios, Dr. McCrum made another dental health picture entitled, "Clara Cleans Her Teeth." I was just a youngster at the time, but the seriousness of dental disease made a deep impression on my young mind. I vowed that some day I would do my bit toward making children safe from this dreadful scourge. I have an excellent set of teeth myself and I take

excellent care of them, so too do my staff officers."

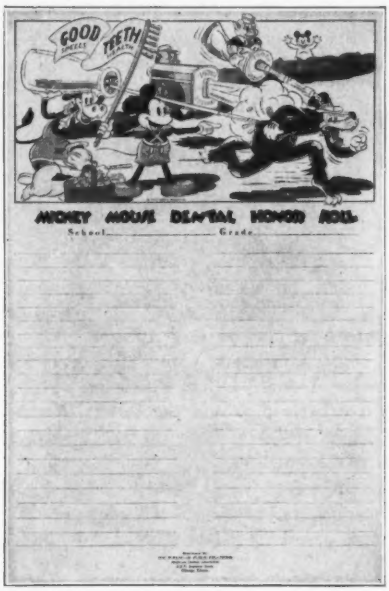
"How do you propose to recruit your army?" asked the interviewer.

"That is quite simple," explained the general. "I propose to turn every dental office and as many schools as possible into recruiting stations. I am asking every member of the American Dental Association, every member of the American Dental Hygienists Association, every school teacher and every health worker to organize one battalion of Mickey Mouse Militiamen. I insist that only dentally fit recruits be enlisted. My staff and I have healthy mouths and clean teeth. In order to belong to my army, applicants must have teeth as good as or better than mine or those of my staff.

"Notify all members of the A.D.A. and such others as you choose that they can secure the necessary enlistment papers and battalion rosters at the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago. The preliminary enlistment paper known as the 'dental certificate' is to be given to any boy or girl who presents satisfactory evidence that he or she has kept the teeth clean for a period of thirty days. This entitles them to become recruits. As soon as the recruit presents a certificate from the dentist that all mouth infection has been removed and all decayed teeth filled, he is given a good teeth button and made a full-fledged Mickey House Militiaman. Each battalion must have a roster in the form of an honor roll. The names of the full-fledged militiamen, that is, those who have successfully passed the dental inspection, are placed on this honor roll roster. Dentists and hygienists recruiting officers can hang the honor roll in their

"Clean teeth" certificate—to be given children who have kept their teeth clean for a specified length of time.

"Good teeth" button—to be given children who have had all dental defects corrected.




Dental Honor Roll—on which is to be entered the names of all children who are free from dental defects.

offices. Teacher recruiting officers can hang it in the class room.

"I sincerely believe," concluded General Mickey Mouse, "that, with the right kind of enthusiastic cooperation by the dentists, hygienists and teachers, I can recruit a nation-wide army of youthful militiamen that will drive the Big Bad Wolf of dental decay out of America—at least I can pull his fangs so that he won't be so dangerous."

Do you wish to recruit a battalion of Mickey Mouse Militiamen? Write to the Bureau of Public Relations, American Dental Association, 212 E. Superior St., Chicago, for one unit of recruiting material. Each unit consists of forty dental certificates, twenty good teeth buttons and one honor roll. This unit sells for $1.

Separate items sell as follows: forty dental certificates 40 cents; twenty good teeth buttons, 75 cents; one honor roll, 10 cents.

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### Straightening Johnny's Teeth

The November 22 issue of the *American Weekly* carried a full page article on the causes and effects of malocclusion. The *American Weekly* has a 6,000,000 circulation in the United States.

The 3,000 word article, simply and plainly worded, was well illustrated with twelve photographs of actual before and after cases. These served to attract and hold the reader's attention.

Lay education of this kind is highly commendable and it is hoped that the response received by the editors will prompt and encourage the appearance of articles on other phases of dental health in the future.

### World Federation of Education

The Health Section of the World Federation of Education Associations, through its chairman, C. E. Turner, cordially invites the members of the American Dental Association to participate in the meetings of the Seventh Biennial Conference to be held in Tokyo, Japan, August 2-7, 1937. The subjects to be discussed are "Health Education," "Health Services" and "Physical Education." School dentists in Japan have requested Professor Turner to add their cordial invitation to that of the section. Details regarding the program can be secured by addressing the secretary, Miss Sally Lucas Jean, 200 Fifth Avenue, New York City.

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### A.D.A. Radio Broadcasts Over Columbia Northwest Chain

Through the cooperation of the Columbia Broadcasting System, the American Dental Association's new series of radio programs, "Dental Customs of Primitive People," are being made available to the following stations:

WOC Davenport, Iowa
KRMT Des Moines, Iowa
KSCJ Sioux City, Iowa
KFAB Lincoln and Omaha, Nebr.
WISN Milwaukee, Wis.
WCCO Minneapolis and St. Paul, Minn.
WMBD Peoria, Ill.
WNAX Yankton, S. D.

The subjects and dates for the coming month are as follows:

January 5: The Dental Riddle of Tristan da Cunha
January 12: Curious Dental Customs of the Ancient Japanese
January 19: Interesting East Indian Dental Customs (1)
January 26: Interesting East Indian Dental Customs (2)

# DENTAL ECONOMICS

## DISQUALIFYING DENTAL DEFECTS*

By E. H. BRUENING,† D.D.S., Omaha, Nebr.

### CHIEF CAUSES OF REJECTIONS

DURING the calender year 1934, of 88,718 original applicants examined by naval medical officers, 66,419, or about 75 per cent, were rejected as unfit for service in the United States Navy.

The principal causes for rejection are listed under twenty-four headings or groups. Defective teeth, eyes and feet, in the order named, account for the largest number of failures.

Seventeen thousand five hundred and ninety were rejected because of "dental diseases and conditions," which accounts for over 26 per cent of the total rejections during that year.

These figures are consistent in comparison with those of other years. In 1933, 43,948 were examined and 30,900 rejected; of which 7,394, or about 24 per cent, were rejected for "dental disease and conditions."

### DATA ON ONE THOUSAND APPLICANTS

Lt. H. D. Templeton, Medical Corps, U. S. N., reports 1,000 medical examinations made at the main recruiting station in Indianapolis, Ind. *(U. S. Naval M. Bull.,* January, 1936).

This group of applicants is representative of the young adults of this district.

Every applicant, with the exception of 119 who were rejected for various reasons other than physical defects, was given a thorough physical examination, regardless of how apparent a major defect might be. Thus, a more comprehensive appreciation of the various physical defects existing in these applicants, and a relative knowledge of how much manpower might be reclaimed and made acceptable in the event of a national emergency, was obtained.

Of the 881 examined, 623 were rejected on account of physical defects and 258 were accepted. Of those physically examined, 71 per cent were found unfit. Only about one half of the 258 accepted would be classed as excellent material, one third as "average" and the remainder as "acceptable."

The physical rating of those accepted was: Class A, 12.4 per cent; Class B, 9.4 per cent, and Class C, 4 per cent.

In the 623 physically disqualified, defects were noted as shown in the accompanying table.

Four hundred and one, or practically two thirds, had marked dental defects. (It is only reasonable to suppose that every man had some dental defects.)

Fifty-four applicants were listed as of insufficient physical development. They represent a class definitely undernourished. It was believed that the general health of this group of poorly developed boys might be further impaired by the

*Prepared for the Medico-Military Inactive Duty Training Unit, Mayo Foundation, Rochester, Minn., Oct. 4, 1936.

†Lieut. Commander, D.C. V-(8) U.S.N.R.

strenuous life and duties of a sailor.

Under the headings dental defects, underweight and insufficient physical development, 41.4 per cent of all rejections are listed. Fifty-five per cent of all cases of insufficient physical development presented major dental defects.

Recent economic conditions have been favorable to recruiting. When these change, the number of Class A applicants will be greatly reduced, as they are the best material for industry as well as for the Naval service, and most of them will be assimilated by the business world.

In this test examination of 1,000 applicants in the Indiana district, 258 were physically qualified for general duty, and in the event of a national emergency, an additional 160 might be made available for duty after certain "disqualifying defects" were corrected or waived. Only 418 of each 1,000 men could be used for active duty.

Of primary interest is the large number of young men with disqualifying dental defects and malnutrition. The causes of these conditions present a serious problem in public health.

The following regulations govern the present dental requirements for admission to the naval service:

The teeth shall be thoroughly examined by a dental surgeon, if one is available. No recruit shall be accepted unless he has at least twenty vital serviceable teeth and of these not less than four opposed incisors, of which two are directly opposed on each side of the dental arch. Teeth properly filled or which have been properly restored by crowns may be considered serviceable when the history and appearance clearly warrant such consideration.

The absence of any of the upper incisors and cuspids or the fact that any of these teeth are markedly out of alinement shall be considered a disqualification for service as a bugler or trumpeter.

Candidates for commissions shall be expected to present a higher standard. Edentulous spaces in the dental arch causing wide breaks in the continuity of the masticating surfaces shall cause rejection. Replacements by bridges are not considered serviceable unless supplying missing teeth in excess of the twenty vital serviceable teeth required.

The dental standards governing appointment to the Naval Academy are the same as for commissions. The oral soft tissues must be in a state of health, and all dental restorations and replacements must be of the highest order. Unerupted teeth are not included in the twenty vital teeth required. All dental treatment, restorations and replacements must be obtained by the candidate prior to entrance to the Naval Academy.

DEFECTS IN 623 PHYSICALLY DISQUALIFIED

| All Dental Defects | Flat Feet | Defective Vision | Defective Color Perception | Defective Hearing | Hernia | Infected Ears | Deformities | Underweight | Underheight | Unclassified Other Causes | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| All defects noted, 401 | 279 | 79 | 54 | 12 | 56 | 12 | 63 | 177 | 15 | 394 | 1,539 |
| Major disqualifying defects, 196 | 131 | 73 | 52 | 8 | 17 | 5 | 15 | 9 | 9 | 108 | 623 |

EXAMINATION OF STANDARDS

1. Bicuspids shall not be classed as "molars" nor shall cuspids be classed as "incisors."

2. A carious vital tooth which can be restored satisfactorily by proper filling may be considered a serviceable tooth. A tooth is not to be considered serviceable when the caries is extensive, when it is involved with marked pyorrhea alveolaris, when it is the seat of chronic infection or when it fails to enter into serviceable occlusion with the opposing teeth.

3. Abutments (natural teeth to which bridges are attached) and crowned teeth may be counted as serviceable only when they appear to be in good condition and supported by healthy tissues.

4. Carious teeth incapable of proper restoration should be noted as needing extraction.

Following are the causes for rejections:

The loss of teeth in excess of the required standards.

Marked pyorrhea alveolaris.

Marked protrusion or retrusion of either jaw or any abnormal condition causing malocclusion.

Extensive restoration by crowns, bridges, dentures or teeth generally unserviceable.

Edentulous spaces in the dental arch causing wide breaks in the continuity of the masticating surfaces.

Nonvital infected teeth, defective root canal fillings or unfilled canals.

Malignant tumors of the alveolar process or benign tumors or cysts which may tend to enlarge.

Syphilitic lesions of the oral membranes.

EXCERPTS FROM NAVAL RECRUITING BULLETIN 59, 1934

The following extracts are from a memorandum prepared by the Dental Section of the Bureau of Medicine and Surgery:

To the professional eye missing teeth do not mean merely so many vacant spaces to be filled. These spaces have a much more profound significance. It is the consensus of opinion that dental caries, which is the principal cause of the loss of teeth in youth, is a local manifestation of general malnutrition or of a metabolic disturbance. It so happens that dental caries may be the only visible evidence of nutritional imbalance, but it is only reasonable to suppose that other body tissues are also undernourished and hence less resistant to disease. The picture presented by the dental condition thus portrays to the critical observer the fundamental as to whether the body has been or is receiving adequate nutrition, without which abundant health and vigor does not exist.

The present personnel of the Dental Corps consists of:

Commanders, 48
Lieutenant commanders, 64
Lieutenants, 60
Lieutenants, junior grade, 60
Total, 232 in regular service

The Dental Officers of the U. S. Naval Reserve number:

Lieutenant commanders, 69
Lieutenants, 98
Lieutenants, junior grade, 65
Total, 232.

The number of dental officers in the Navy was considered inadequate for service conditions and recent legislation has increased the allowance to one dental officer for each 500 personnel, which will bring about a marked improvement in this service.

The enlistment of recruits requiring much dental treatment can only result in a proportionate lessening in the amount of dental service available to the personnel.

The general condition of the Navy dental equipment is excellent. New instruments and appliances of the most modern type are furnished and replacements of old equipment are made as is necessary.

The present dental standards of enlistment are so low that a further decrease

would obviate the possibility of proper mastication of food.

Bridges and plates are poor substitutes for natural teeth and require service upkeep and renewals very often, with loss of abutment or adjacent teeth, necessitating new appliances with attendant expense, expenditure of time and further decrease in masticatory function.

It is recognized that a sound mind usually accompanies a sound body, and it should be possible to get recruits of high intelligence without lowering the physical requirements.

The proportion of enlistments to the population, especially in the Eastern States, is such that it would seem that dental requirements might with profit to the Service be raised rather than lowered.

### DENTAL CARE IN SERVICE

Extracts from a letter from Comdr. E. W. Willett, D.C., U.S.N. U.S.S. Pennsylvania Flagship, U. S. Fleet, Sept. 23, 1936, were as follows:

All types of corrective dental work is done on board ship with the exception of gold foil fillings, porcelain jacket crowns, some types of bridge work and orthodontia.

Three ships, eighteen stations and hospitals are now equipped to provide prosthetic laboratory services. U. S. S. *Medusa,* U. S. S. *Relief,* U. S. S. *Utah;* Naval Academy, Annapolis, Md., Marine Barracks, Quantico, Va., Naval Air Station, Pensacola, Fla., Navy Yard, Brooklyn, N. Y., Submarine Base, Coco Solo, C. Z., Puget Sound Navy Yard, Bremerton, Wash., Naval Training Station, Great Lakes, Ill., Fourth Marines, Shanghai, China; Naval hospitals: Portsmouth, Va., Mare Island, Calif., San Diego, Calif., Canacao, P. I., Pearl Harbor, T. H., Chelsea, Mass., Newport, R. I., Philadelphia, Pa., Washington, D. C., and Parris Island, S. C.

Prevalence of dental decay among enlisted personnel is far less than in the past, owing partly to higher requirements in the recruiting stations, and to the system of concentrating dental officers at Naval Training Stations, where every effort is made to make incoming personnel "dentally fit" before they complete their training.

Efforts are made to hold an annual dental inspection of every member of the Navy and Marine Corps personnel, by dental officers. The defects found are noted and corrected as soon as possible.

### PREVENTIVE MEASURES

The foregoing facts and a recent survey by the U. S. Public Health Service and the American Dental Association published in U. S. Bulletin No. 226 demonstrate the great need for preventive treatment, which must be supplied during the early childhood of every person. Most dental defects can be prevented and at comparatively small cost, if the beginnings of oral diseases are properly treated. In addition to this, boys and girls must be armed with good toothbrushes and taught some quite simple rules of diet and hygiene.

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Reports from Omaha Naval Recruiting Station by Lt. Comdr. Lincoln Humphreys, M.C. U.S.N.

Reports from Comdr. E. W. Willett, C.C., U.S.N., U. S. S. Pennsylvania.

# DOCTORS, DENTISTS AND DOLLARS

By JOHN T. HANKS,* D.D.S.

IN the October issue of *Fortune* is a most interesting article dealing with the Sixth Quarterly Survey made by that magazine. It is divided into seven parts, and an explanation is given as to how it is conducted, and classifications are made. The political trends are set forth, the W.P.A., monopolies, wet vs. dry, and other pending questions studied.

One of the subjects under discussion is: "Doctors, Dentists, and Dollars." The questions propounded by the investigators were: What do you spend for medical and dental care? Would you pay $10 a year for partial health insurance? Should the Government provide care for those who can't pay?

The fact is cited that 85,000 persons have enrolled in the plan of the Associated Hospital Service of New York in its first year, paying $10 for twenty-one days of semiprivate room hospital care, and that throughout the country there are more than seventy other such hospital associations.

In this way, the white collar and upper wage-earning class provide in advance for the unpredictable costs of hospital care that they could not otherwise provide for.

A tabulation of replies to the question whether those queried would be willing to pay $10 a year for hospital expenses for each member of the family showed that 47.9 per cent answered yes, 44.3 per cent no, and 7.8 per cent were uncertain. It was found that 58 per cent paid nothing or under $25 for medical care annually. It was further shown that 50 per cent of the middle classes would be willing to pay, while more of the prosperous were not interested, and that the poor could not afford the $10 payment.

If we turn to dental service, the results show that 71.7 per cent of the families have no yearly dental bill or pay under $25 for dental services. It was demonstrated that the prosperous received more dental service and that the size of the bill increases as advance is made up the economic scale. Forty-three and three tenths per cent would be willing to pay $10 annually for dental care and 49.4 per cent would not.

The conclusions drawn were that about half of the population would be willing to pay $10 annually for dental or medical health insurance, that a great many people are willing to pay more for this protection than they paid for such service last year and that a great amount of money would be available for health care through such plans.

The fact that health insurance seemed to be received favorably by large numbers of our population, it was further stated, did not dispose of the question of socialized medicine and dentistry, as was indicated by the answers to the following question. This question is of even more interest to the health professions than health insurance, as it indicates a strong trend of the public toward medical and dental care for the whole population, regardless of income.

The question was: Do you believe that the government should provide free medical and dental care at the expense of the

*Deceased.

taxpayer for those who cannot pay? The answers were 74 per cent yes, and only 20.3 per cent no. The prosperous, who are the chief taxpayers, agreed 65.3 per cent with the majority. This, the article concludes, "indicates an impressive body of opinion among all classes in favor of extending government health service from the preventive to the clinical." It is this force of opinion which will determine the question of a more social attitude toward health service.

Fortune has contributed a valuable study of this subject and it is interesting to note the conclusions drawn. The foremost is the statement of opinion of a large sample of the population of all classes that those who cannot afford payment for medical and dental service should receive these necessary aids through the expenditure of tax money. This is not "socialized medicine" as we understand that term, which would serve all of the population regardless of their ability to pay.

The idea back of this conclusion of the survey more nearly approaches the "gradient plan," formulated by Doctor Elliott of the Medical Society of the State of New York, when he showed that those in the upper levels of income needed no help to avail themselves of any desired health service.

Those of varying levels in the middle class could receive help in various forms from installment payments to insurance. The members of the population in the lower levels would receive care through government aid.

While those who prepared this survey use terms such as "health insurance" and "socialized medicine," it is evident on closer study that these terms have not the meaning generally imputed to them by the health professions.

The "health insurance" as stated is evidently a voluntary form of insurance and not the compulsory form advocated in some quarters. It is quite a different matter to supply hospital care on an insurance basis (as this is a business similar to hotel accommodations) than to endeavor to supply medical attention on a similar plan. The cost of service of a hospital can be calculated beforehand, but who can calculate what medical service will be necessary?

The indemnity received by the insured must have a definite actuarial relation to the premium paid or the plan will fail. Also, it is a very different idea to furnish a cash indemnity for loss of time or a money payment on a predetermined scale for the care of certain injuries from what it is to supply medical care in kind, as in the scheme under the British system.

When we discuss compulsory sickness insurance, we are entering on an entirely different subject. Here, government intervenes, compelling employer and employe to contribute definite amounts each week into the state insurance fund. Commissions, councils and advisory boards with bureaucratic functions are then set up. The cost of administration of such a scheme would either cut the benefits paid to the insured or would reduce the fees paid to the members of the medical and dental professions who participated in this work. It would seem that the complete care of the sick poor is of such a humanitarian nature that here is the place to apply a social (not socialized) form of health care.

The figures shown in the survey would seem to indicate that the public believes this also and that they would be ready and willing to spend their tax money for an optimum service of this kind, could they receive the assurance that their money is honestly expended for scientific health service.

# ST. PAUL, MINN., DENTAL HEALTH PROGRAM

By M. D. WALLS, D.D.S., St. Paul, Minn.

THE dental health program of St. Paul is an extensive one. Practically every part of it is under the control, either directly or indirectly, of the St. Paul District Dental Society, which makes for better cooperation between the different sections. The program is as follows:

## SCHOOL CLINICS

The Women's Auxiliary of the St. Paul District Dental Society sponsors and controls the school clinics, of which there are eight scattered throughout the schools of the city. Eight dentists are employed half time and three hygienists full time in these clinics. This work takes care of all the city's indigent children in the kindergartens and first four grades of the public schools. From approximately 2,500 to 3,000 children are thus given complete dental care. The financial status of the family of each child cared for is carefully checked by the social welfare agency. In conjunction with the foregoing, an extraction clinic is held each Saturday morning for these children, the members of the dental society donating their time for this work. The three hygienists make examinations and appointments and do all prophylactic work. The clinics, which are financed by the board of education, the community chest and the women's auxiliary, require an outlay of from approximately $11,000 to $12,000 a year.

The actual clinic work is followed up by an educational program. The hygienists give health talks and teach the children how to brush the teeth. Each child is given a toothbrush. A city-wide poster contest is held each year among the children as a follow-up measure.

Through the sponsorship of the parent-teacher's association, every child in the city is given a dental examination each year. The members of the dental society make the examinations and the child is sent to his family dentist for required service. All of the foregoing is carried on as a unified project by the women's auxiliary with the cooperation of the parent-teacher's association and the board of education and under the advisory control of the dental society.

During the past year, the visual education program of the Good Teeth Council was used throughout the St. Paul District in all of the schools and community centers. This was remarkable in its educational value to both children and adults.

## CITY AND COUNTY HEALTH DEPARTMENT

The city and county hospital, under the direction of the health department and with the cooperation of the dental society, maintains a clinic for the extraction of teeth and the emergency treatment of indigent people of all ages. Three dentists and an intern, each employed six days a week, conduct this work. Also, some operative work for children is done.

## PRIVATE CHARITY

1. The Wilder Charities, a private charity foundation maintains a clinic where emergency work of all kinds and some operative work may be had by indi-

gent people of all ages. This again cooperates with the dental society.

2. A trust fund in the dental society has for a number of years maintained a dental clinic for children in one of the Neighborhood Houses.

BOARD OF PUBLIC WELFARE

A little over a year and a half ago, panel dentistry was initiated in St. Paul under the jurisdiction of the St. Paul District Dental Society and financed by the board of public welfare of the city.

A fund of $2,000 a month was allotted to start this work. It was soon found necessary to increase this amount to $3,000 a month, which is the present amount.

Two dentists, each employed half time, act as examiners in a centrally located office. The relief patient must present to the examiner an order from his social worker. The examiner then indicates the necessary work and the amount of money to be paid for it on an order for the work. This order is sent to the dentist of the patient's choice. If the patient has no choice, he is referred to one of the men on the panel. Dentists are chosen for reference in rotation, alphabetically and geographically.

The dentist then does the work which is designated on the chart made out by the examiner. When it is completed, he signs the order and sends it in and receives his check.

All work done must conform to Minnesota standards as laid down by the state university. The fee schedule is set by the St. Paul District Dental Society in an agreement with the board of public welfare and each dentist must adhere to it. An average fee was ascertained and then, because this is a temporary emergency plan to care for those people on direct relief, a 40 per cent discount was determined on as fair.

ST. PAUL'S S.E.R.A. AND WPA SCHOOL DENTAL PROGRAM*

As we all know, the depression affected the professional man very seriously. Among physicians and dentists, those most affected were the beginners and the older men, at or near the retirement age. We were very much pleased in St. Paul to be able to give greatly needed assistance to physicians and dentists in carrying out health supervision work in the schools.

At the beginning of the second semester, in the 1934-1935 school year, the dental phase of the program was launched. Thirty dentists were employed on this. Ten thousand fillings alone were placed.

Social workers obtained from school principals the names of pupils needing dental attention, and the nurses furnished lists of children who had been examined by oral hygienists and found to be in need of dental care. Parents were informed regarding the dental project and requested to sign consent slips. As the consent slips came in, appointments were made with dentists.

Under the S.E.R.A., St. Paul provided dental care to children in indigent families by sending these children to the private offices of the dentists. The dentist received a monthly compensation of from $35 to $70, the amount depending on the number of patients. For each dollar allowed, he gave an hour of his time in his own office, furnishing his own equipment and materials. He worked from three to four hours a day on indigent school children until his compensation was worked out. On this basis, a dollar was paid toward defraying the dentist's overhead, while at the same time more than a dollar's worth of dental care was given to a needy child.

*Excerpts from a report by George W. Snyder, M.D., Director of the Division of Hygiene.

The dental work was not confined to the public schools. For the first time, a dental project of any extent was carried on in the parochial schools in St. Paul. Since the parochial school children do not have any school dental care similar to that given to the indigent public school children in St. Paul's eight regular dental clinics covering the first five years of school life, it is not surprising that the teeth of the parochial school children were in far worse condition than the teeth. of public school children.

All children of parents on relief are eligible for free dental care under the St. Paul plan. Those who have been on relief are given consideration next, and in case of doubt as to eligibility, a home call is made by the social worker.

In the period in which the dental project was carried on, thirty dentists performed 18,000 operations in a total of 9,000 hours; making the dental cost but 50 cents an operation. A total of 3,534 pupils benefited from the program.

As we are frequently asked about the relationship between good scholarship and a healthy mouth, we made a study of this phase of the project with the aid of three school principals. The schools covered were widely separated and of different social environment. The study included 1,042 children in grades from kindergarten through the eighth grade.

It was interesting to find that only 50 per cent of the "A" pupils needed dental work in contrast to 90 per cent of "E" pupils needing it. In other words, the percentage needing dental care increases as the scholarship record decreases.

To carry out the comparison further: None of the pupils doing excellent school work had teeth in very bad condition, while the pupils who were failures in school work were in the class of those having teeth in extremely bad condition.

Following up the replacement of the E.R.A. with the WPA, another arrangement was necessary to operate the project as dentists, physicians, nurses and oral hygienists were all included in Class I with the fixed compensation of $103.50 for 132 hours of work.

No one could be assigned to any work project unless he was certified as eligible for relief. This reduced the available personnel to almost an unworkable minimum. At the present time, only eight dentists are employed in the project and the rate of compensation has been increased to $2 an hour for dentists and physicians, which allows a maximum of $102 to be earned in any one month, thus enabling the dentist to devote more time to his private practice.

A summary of the dental work done on the indigent children attending the St. Paul public schools during the school year 1935-1936, by both the eight regular school dentists and the eight WPA dentists, is approximately as follows:

| | |
|---|---|
| Hours worked by dentists | 8,000 |
| Appointments | 10,000 |
| Cases completed | 4,000 |
| Amalgam fillings | 16,000 |
| Total fillings | 18,000 |
| Permanent teeth restored (first molars) | 6,500 |
| Permanent teeth restored (others) | 3,500 |
| Total operations | 25,000 |

# FEDERAL SOCIAL SECURITY ACT AND DENTISTS

THE regulations that have been promulgated by the Bureau of Internal Revenue looking toward the assembly of detailed data regarding the employers and employes from whom taxes are to be collected are of interest to dentists. The Federal Social Security Act provides for unemployment insurance and old age pensions as follows:

1. Unemployment insurance: The federal law levies on the payrolls of the employers of eight or more persons. Some states have laws levying on employers of four or more persons, and the state law governs. The payment of this tax is entirely by the employer beginning with 1 per cent of the total payroll in 1936.

2. Old age retirement: This applies to dentists having full or part time employes in their offices, the tax to be paid by and for every employe under 65 up to $3,000 of salary received, the employer to pay 1 per cent and retain 1 per cent from employe's salary beginning Jan. 1, 1937.

The employer is liable for regular payments of 2 per cent to the Internal Revenue office in his district. Form SS-4 should be filled out by every employer and For SS-5 by every employe not in exempted classifications (agricultural labor, domestic service in private homes, casual labor not in the course of the employer's trade or business, service performed by a person who has attained the age of 65, service performed in the employ of the United States or of any state or subdivision or instrumentality of either and service performed in the employ of a corporation, community chest, fund or foundation organized and operated exclusively for religious, charitable, scientific, literary or educational purposes, or for the prevention of cruelty to children or animals, no part of the net earnings of which inures to the benefit to any private shareholder or individual).

Dentists are apparently considered as independent contractors. If they do not have any full or part time employes in their offices, they apparently are not subject to the taxes imposed.

If in doubt regarding the provisions of the law, it is advisable for all dentists who employ assistants to consult the local postal authorities regarding the proper procedure.

## Death of John T. Hanks

The sudden death of John T. Hanks, November 18, came as a distinct shock to his many friends and admirers, both in and outside the profession. The Committee on Economics, of which he was vice chairman, of the American Dental Association will especially feel his loss. His many valuable contacts, his judicial disposition, his insight into the needs and future of dentistry made him one of the most valuable members of the committee.

Besides conducting an exceptionally large practice, he had for years taken an active interest in Association affairs. His passing was just as he would have wished it—he died in the harness. Returning from a WPA dental meeting, he succumbed to a heart attack in a New York subway. The week prior to his death, he had been in Washington conferring with federal officials on dental affairs. The last of the month, he was to have returned to Washington for the same purpose. As chairman of the Division of Dental Supplies for the American Red Cross, he was scheduled to address that organization during the week of the twenty-third. He spent his last hours

of life attending to the affairs of organized dentistry.

The dental profession may well mourn the passing of an exemplary member. Organized dentistry laments the loss of an indefatigable worker.

### Michigan Department of Health Bureau of Mouth Hygiene

Through the Federal Social Security Act, funds have been provided which have made possible considerable enlargement of the various activities of the Michigan Department of Health. Among these is a provision for the Bureau of Mouth Hygiene, which enables its director, William R. Davis, to have a full time assistant for additional dental health promotion activities. These funds are assured until July 1, 1937, and Floyd H. DeCamp has accepted a temporary appointment for this work until that time and entered on his duties November 1, 1936. The activities of the Bureau of Mouth Hygiene will continue to be entirely educational and the addition to the staff will enable the bureau to extend its dental educational work very materially, especially in the field where actual contacts are so much more effective.—*J. Michigan D. Soc.*

## CURRENT LITERATURE

*Control of Tobacco Habit (J. L. Dorsey, Ann. Int. Med., 10:628 [Nov.] 1936):* The occasion often arises where it is necessary to restrict the use of tobacco (as in leukoplakia and other oral irritations). With the patient who is accustomed to much smoking, this is often extremely difficult. The author suggests the substitution of lobeline, a derivative of lobelia or Indian tobacco. An honest desire on the part of the patient to stop smoking is a primary necessity. The patient stops smoking after the midday meal on the first day of treatment and at that time takes one eighth grain of lobeline sulfate in capsul by mouth. The dose is repeated whenever the urge to smoke is felt. Usually, from three to twenty-four doses in twenty-four hours suffice. The desire to smoke decreases and tobacco hunger becomes easier to put off without resorting to the drug. When the acute discomfort of the tobacco hunger is passed, the lobeline may be discontinued.

Hamilton Robinson.

*Body Build and Disease in Children (H. Bakwin and R. M. Bakwin, Tr. Am. Pediat. Soc., 47:28):* External dimensions of children with three types of disease (epilepsy, chorea and rheumatic heart disease) were compared with those of control groups from the same social environment. Statistically reliable variations noted in the disease groups were: narrowing of the face and its component parts and the shoulders and hips (except in chorea), and lower weight in chorea and cardiac groups. No changes in body height, sitting height or height of the upper part of the face were noted. The question as to whether these changes preceded or followed the disease is difficult to answer for epilepsy and cardiac disease. In acute chorea it is evident that they preceded the disease. The authors suggest that the changes are outward, structural and measurable changes resulting from trauma that has produced subtle, physiologic changes on which predisposition is based.

Hamilton Robinson.

*Vincent's Angina—Report of Two Cases in Same Family (R. E. Smith and A. B. Dusinberre, Clifton M. Bull., 20:24 [Jan.] 1936):* Two cases in one family were initiated by general symptoms of severe headache, with local lesions appearing secondarily. The first case was in a 25 year old woman with a history of recurrent

tonsillitis, bleeding of the gums and a vitamin C-mineral deficient diet. A vitamin rich diet and medication, liver extract therapy (for a low white cell count) and local treatment were used successfully. The second patient, a brother of the first, was 22 years old with a negative past history except for a tonsillectomy at 11 years. He remembered drinking from the same glass as his sister. General and local treatment cleared up the condition without use of a high vitamin diet. Local treatment in both cases included spraying with a 50 per cent solution of hydrogen peroxide, application of 50 per cent arsphenamine in glycerine paste in interdental spaces and on ulcers and frequent use of a sodium perborate mouth wash. As soon as the lesions had cleared up, the teeth were thoroughly cleaned and scaled. The authors point out that (1) the condition of the teeth and gums bears no definite relationship to susceptibility, (2) symptoms of general acute infection may precede local signs, (3) specific treatment is necessary for Vincent's infection, (4) individual responses to similiar treatment may vary and (5) malignant leukopenia may develop, but is not always the cause of death in this serious disease.

HAMILTON ROBINSON.

## FOREIGN LITERATURE

*Tumors of Palate (Walter Howarth, Brit. M. J., 2:988 [Nov. 14] 1936):* The mixed parotid tumors are slow growing and are present many years before discovery. They are usually encapsulated and generally regarded as comparatively benign. Hemangioma and hemangiofibroma are rare in the palate, but their existence should not be forgotten. In these vascular tumors, diathermy is valuable. Fatty tumors in the palate are extremely rare. Adenoma is also extremely rare in the palate. When found, they are usually in the soft palate.

J. FRANK HALL.

*Blood Studies in Infancy (A. Stewart, Brit. J. Child Dis., 165 [July-Sept.] 1936):* Sixty-one infants were examined for hemoglobin percentage and red cell count. The children ranged in age from 2 days to 27 weeks. The examinations were made each week. It was noted that the hemoglobin was reduced soon after birth, the maximum occurring between the ninth and eleventh weeks. A gradual rise was noted about the third month, which continued until the child was 6 months old. The red cell count was also diminished immediately after birth, continuing to diminish until the third month, at which time the count gradually increased until the sixth month. It was rare for the color index to be low before the infant was 7 months old.

J. FRANK HALL.

*Treatment of Neuralgias (Green and Pierson, Anes. & Anal., May-June, July-August, 1936; abstr. Brit. M. J., 2:74 [Nov. 7] 1936):* The authors advocate the use of the electric percussion hammer as an accurate means of localizing the nerve affected. Additional physical examination, including roentgenograms of the spine and affected parts, should be made. They claim satisfactory results from alcohol nerve block injections. In the administration of the nerve block, a three-dimension roentgenogram localization is invaluable. Certain types of joint affections with an unfavorable orthopedic prognosis are often greatly benefited by alcohol nerve block.

J. FRANK HALL.

*Some Considerations of Pathology and Treatment of Dental Infection of the Antrum (C. N. Strong, Proc. Royal Soc. Med., 29:1547 [Oct.] 1936):* By means of lipiodol injected into tooth sockets, the author was able to make roentgen-ray studies of the blood supply. It was demonstrated that the blood supply of the teeth and that of the antrum are inseparable, that the arteries form a plexus on the outer and lateral walls of the antrum, that this vascular plexus intimately connects tooth sockets and that the vessels are in the antral mucosa for the first half of their course. Examination of tooth pulps of teeth denervated by antral operations revealed normal blood vessels. The relation of the

nerve supply of the teeth to the antral mucosa is pointed out as a cause for the pain felt in sound teeth during infection of the antrum. The likelihood of the antrum's becoming infected as the result of periodontal infection is more important than the pulpal route when there is a very thin or no bony layer between the root apex and the antrum.

B. G. Bibby.

*Further Investigations of Bacteriologic Infections of the Mouth (H. Round, H. J. R. Kirkpatrick and C. G. Hails, Proc. Roy. Soc. Med., 29:1552 [Oct.] 1936):* The occasional occurrence of sloughing of soft tissues, osteitis and osteomyelitis following infiltration anaesthesia prompted a further bacteriologic study of injections in ninety patients. Unsterilized mucosa at the site of injection always showed *Streptococcus viridans, Streptococcus hemolyticus, Staphylococcus aureus* or *Micrococcus pharyngis-flavus.* After sterilization with 2.5 per cent iodin in spirits, the site of injection was always aseptic. Cultures made from the injection needle showed organisms in eighteen instances, in seven of these *Staphylococcus aureus;* in ten, *Streptococcus viridans,* and in one, a combination of both. The staphylococcus was most commonly associated with postextraction complications. In another series of experiments, openings were made through flaps to root apices and cultures made. The authors claim an association between various types of systemic lesions and the types of organisms isolated from the roots. In a third series of experiments, blood cultures were taken from ten patients with peridental lesions. All were negative. After chewing hard candy, two of these showed positive blood cultures. The organisms recovered were *Streptococcus viridans* and *Staphylococcus aureus.* The authors conclude that the submucous tissues are frequently infected and as a result of the lowering of vitality from the pressure and loss of blood accompanying injection, an infection may become established.

B. G. Bibby.

*Ameloblastomas (Les adamantinomes) (J. Bercher, F. Codvelle and Ch. Ruppe, Presse Med., 92:1809 [Nov. 14] 1936):* The authors discuss the various clinical and anatomic types of ameloblastomas and present a general classification of dental tumors. They include anomalies, areas of hyperplasia and inflammatory growths in their listing, as well as true neoplasms. Clinically, ameloblastomas are divided into those of limited growth, those of unlimited potentiality and intermediate forms. They conclude that these tumors are derived from the dental lamina or epithelial débris, consisting of unequal combinations of epithelium and connective tissue; that the many types of ameloblastoma observed result from various combinations of these two tissue types, and that those chiefly made up of connective tissue and which form teeth usually do not recur (type of limited growth). Generally, those formed chiefly of epithelium, as the polycystic variety, have unlimited growth potentiality and are usually locally malignant.

Hamilton Robinson.

# MISCELLANY

## BOOK REVIEWS

*Surgery for Dental Students.* By Philip H. Mitchiner, M.D., M.S. (Lond.), F.R.C.S., Hon. Surgeon to H. M. the King; Surgeon and Lecturer and Lecturer in Surgery, St. Thomas's Hospital; Member of Court of Examiners, Royal College of Surgeons, England; Lately Examiner in Surgery, Universities of London, Birmingham, and National University of Ireland; Clement E. Shattock, M.D., M.S. (Lond.), F.R.C.S., Surgeon and Lecturer in Surgery, Royal Free Hospital; Formerly Examiner in Surgery to the University of London; and Examiner in Pathology to the Conjoint Board Royal College of Surgeons; Edward G. Slesinger, O.B.E., M.S., B.Sc. (Lond.), F.R.C.S., Surgeon and Lecturer in Surgery, Guy's Hospital; and Cecil P. G. Wakeley, D.Sc. (Lond.), F.R.C.S., F.R.S.E., Senior Surgeon and Lecturer in Surgery, King's College Hospital; Member of Court of Examiners, Royal College of Surgeons, England; Examiner in Surgery to the Universities of Glasgow and Bristol; Formerly Examiner in Surgery to the University of London, the University of Wales and the National University of Ireland. 364 pages; 105 illustrations; price, $4.75. Published by William Wood and Company, Baltimore, Md., 1936.

This work has been prepared with special reference to the needs of students, and it might well have borne the title "Pathology and Surgery for Dental Students." It is informative, not only on the surgery but also on the pathology of the subject, and it deals with structures far removed from those associated with the head, face and neck. In short, it gives a quick glance at most of the affections of the body, at least to an extent sufficient to interest the dental student. A dental student is fortunate indeed who has this book in his possession, and in fact it will not do the experienced practitioner any harm to review it occasionally. "Of the making of books there is no end," and the more we have of this type, the better.

*Applied Dietetics.* The Planning and Teaching of Normal and Therapeutic Diets. By Frances Stern, Chief of Food Clinic, the Boston Dispensary; Assistant in Medicine, Tufts College Medical School; Instructor in Dental Pediatrics, Tufts College Dental School; Special Instructor in Dietetics in Social Service, Simmons College, the School of Social Work. 263 pages; price, $3.50. Published by The Williams & Wilkins Company, Baltimore, Md., 1936.

The subject of diet has in recent years come in for a great deal of attention, so much so that at times it almost seemed as if instead of being "done to death" we were in danger of being dieted to death. But this subject will not down, and in faith it should not down till the profession and the public give more intelligent attention to it. The present volume was compiled under the able direction of a practical dietitian, who has charge of an important food clinic and has various other qualifications for the task. The number of tables and dietary outlines is almost bewildering, but when analyzed they all have a logical bearing on the subject in hand. As a reference book, it gives access to every conceivable topic that in any way has reference to diet in relation to health or disease.

*Full and Partial Denture Prosthesis.* By Lee Walter Doxtater, D.D.S., New York City. Formerly Professor of Crown and Bridge Prosthesis, Dental School of New York University. 261 pages; illustrated with 251 engravings; price, $6. Published by Dental Items of Interest Publishing Co., Inc., Brooklyn, N. Y.; London, Henry Kimpton, 1936.

The preface to this book was written by

John Oppie McCall, owing to the fact that the author, Dr. Doxtater, died just as he had his book completed. The major part of the work is taken up with full dentures of the approved type, while the latter part illustrates some unique partial denture restorations, particularly those of unilateral abutment construction. Evidently, Dr. Doxtater was very ingenious without resorting to some of the freakish constructions that are sometimes seen. A notable feature of the book is the character and excellence of the illustrations. The publishers have in previous works given evidence of a quality in illustrating that should commend them to the consideration of the profession. Good cuts are most attractive in any book and the present volume is typical of the best.

*Oral Diagnosis and Treatment Planning.* A Textbook for Students and Practitioners of Dentistry and Medicine. By Samuel Charles Miller, D.D.S. (Editor), Associate Professor in Charge of Periodontia Department, New York University College of Dentistry; formerly Chief of Diagnosis, New York University College of Dentistry; and Twenty-two Contributors; with an introduction by Allen T. Newman, M.S., D.D.S., Dean, New York University College of Dentistry. 562 illustrations including 15 color plates. 620 pages; price, $7.50, in washable cloth. Published by P. Blakiston's Son & Co., Inc., Philadelphia, Pa., 1936.

One great benefit of this book is to correlate the findings of the two groups, medicine and dentistry. It is only when the two come together and confer that the best interests of the patient are conserved. The author has done well to bring to his aid the leading men in both fields. Surely diagnosis is of all things most important. It has frequently been intimated, and with reason, that the treatment of the ordinary diseases was a comparatively simple matter provided the practitioner was sure of his diagnosis, so that more and more the significance of diagnosis is being emphasized. There has been too much guesswork in diagnosis in the past and this has accounted for many failures. The introduction to the volume is by Allen T. Newman, dean of the New York College of Dentistry, and some of the ablest men have contributed to the text. The illustrative work in the book is of special value, so much so that a study of the plates and photographs will go a long way toward enabling the ordinary diagnostician to identify the various affections when he sees them in the mouth. It is deemed advantageous if not wholly essential for the general practitioner to be able to recognize the common diseases of the mouth, and we know of no previous work that so effectually lends itself to this study as the present one. The plates are particularly attractive and the photographs are excellent. It gives us pleasure to commend the book very highly.

*A Text-Book of Operative Dentistry.* By William Harper Owen McGehee, D.D.S., M.D., F.A.C.D. Formerly Head of the Department of Operative Dentistry, Professor of Operative Dentistry and Secretary of the New York University College of Dentistry; Formerly Professor of Operative Dentistry in Western Reserve University and in the Ohio College of Dental Surgery. 922 pages; price $10, in washable cloth. Second edition, revised. With 1,040 illustrations. Published by P. Blakiston's Son & Co., Inc., Philadelphia, Pa., 1936.

The first thing that impresses the reviewer in contemplating this book is its comprehensive character. A volume of 922 pages with 1,040 illustrations entails an amount of work that few men in the profession would care to undertake, and the fact that it is so well done is a tribute to the author. The chapter on "Diagnosis" would at first glance seem to reach out beyond the bounds of operative dentistry where it deals with such subjects as certain of the reflexes such as "Rhomberg's," "the patella reflex" and "Babinski's"; but this is only in keeping with the avowed purpose of the book to deal with everything that touches even in the remotest manner the central subject in hand. The chapter on "Prevention of Oral Diseases," appropriately places great emphasis on this subject, and will well repay extended study. A practical, though much neglected subject is found in chapter VII

dealing with positions at the chair. If operators would study this matter more carefully and profit by it, the tedium of everyday work would be greatly lessened, and their hours of labor would be appreciably shortened. Naturally the "Preparation of Cavities" comes in for extended notice. It is the basis on which the successful filling of teeth is maintained and the nearly sixty pages of text need not be considered out of proportion for the subject. Incidentally, there is a minor discrepancy on page 343 where the figures 373 and 374 are transposed. This when noted is manifestly so apparent that little or no harm will come from it. In considering the subject of filling materials, it is refreshing to note the author's frank emphasis on the fact that gold foil is definitely coming back to favor after the recent slump in interest on the part of the profession. The subjects of "Inlay Work," "Ceramics," "Pulp Canal Work" and other standard topics are carefully considered, and the volume as a whole must be commended most highly as a notable contribution to the literature of the profession. The publishers have cooperated most loyally and effectively to bring the work to its present state of excellence, and both author and publisher may well be congratulated.

*Principles and Practice of Applied Dental Aesthetics.* By Horace Hayman Boyle, H.D.D., and L.D.S. (R.F.P.S.) Glas., H.D.D. (R.C.S.) Edin. Late Captain, D. Army Medical Service; Dental Surgeon to the Ministry of Pensions; Consulting Dental Surgeon under the Board of Control in Lunacy to the Swansea and Merthyr Joint Mental Hospital; Tutor in Advanced Dental Study for the Medical Correspondence College, London. 238 pages; 108 illustrations with 109 original photographic illustrations. Price, 21 shillings net. Published by Henry Kimpton, London, 1936.

The title of this book might logically have been "Applied Dental Prosthesis, with Special Reference to Esthetics." The volume embraces almost the entire field of artificial denture construction, as may be realized by reference to some of the chapter headings. "The Alignment of the Teeth and the Curvatures of the Occlusion Planes"; "The Preparation of Plaster of Paris or Artificial Stone Models"; "Fractures of the Jaws and Immobilization," and "The Significance of the Masticatory Function." The book is a serious and painstaking effort to present the subject in a thoroughly comprehensive manner, and the whole has been carried out with laudable cooperation between author and publisher. The illustrative matter is especially fine, a contributory factor to which is the superior quality of the paper. No expense has been spared in this particular, and as a result the volume is a most gratifying example of the bookmaker's art. The author has put the best energy of which he is capable into the preparation of this volume, and he is entitled to the thanks of the profession, as well as to that of all of those who are at all interested in the publication of books. A pleasing diversion is presented in the frontispiece, a photographic reproduction entitled "Wayside Dentistry" of about the year 1755.

## REGARDING DEATH CERTIFICATES

By W. I. Jones, D.D.S., Columbus, Ohio

The duty of signing death certificates is an obligation imposed by the laws of the state on all physicians (osteopathic, homeopathic, allopathic) alike. It is not a right or privilege vouchsafed to them by anything in the medical practice act.

A physician according to the highest authorities in the English language is one who is skilled in the art of healing diseases. This, then, being the definition of a physician, who can say that a dentist is not a physician? The fact that dentistry is regulated in a separate article and as an independent calling from that of a medical doctor does not in any manner affect the character of its functions to the public welfare.

The functions of the dentist are now more extensive and more important to the public welfare than they ever were before. In a special sense, he is legalized to practice both medicine and surgery because administration of drugs and surgical operations in the oral cavity or on adjacent parts,

cannot rationally be considered otherwise. He is within the purview of both the letter and reason of the law a physician, just as much so as a doctor of medicine. This being the case, he should be obliged to accept his responsibility when he has been in professional attendance at the time of the death of a person. In other words, it should be his duty and not his right to sign a death certificate under such conditions.

The lack of this right or obligation is a stigma that the dental profession should no longer tolerate.

327 East State Street.

## NEWS

*Testimonial Dinner to Dr. Anthony:* On Saturday evening, December 12 at 6:30 p.m. at the Bellevue-Stratford Hotel in Philadelphia, a testimonial dinner was tendered L. Pierce Anthony, editor of *The Dental Cosmos,* prior to his assuming his duties on the editorial staff of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION.

### DEATHS

*Amann, Anthony Louis;* Sidney, Ohio; Ohio College of Dental Surgery, 1892; died October 29; aged 71.

*Bevan, James A.,* Kankakee, Ill.; Northwestern University Dental School, 1901; died September 17.

*Bland, A. B.,* New Orleans, La.; Tulane University School of Dentistry, 1910; died October 17.

*Brown, J. Roy,* Quincy, Ill.; Chicago College of Dental Surgery, 1894; died November 26.

*Cawood, Herman H.,* Lancaster, Pa.; School of Dentistry University of Pennsylvania, 1924; died August 7; aged 35.

*Coates, J. A.,* Cleveland, Ohio; Western Reserve University School of Dentistry, 1902; died October 25; aged 68.

*Crawford, Don A.,* Cleveland, Ohio; Western Reserve University School of Dentistry, 1919; died September 28; aged 38.

*Dilworth, J. Warren;* Philadelphia, Pa.; School of Dentistry University of Pennsylvania, 1899; died October 22; aged 60.

*Durschang, Anthony C.,* New York City; New York College of Dentistry, 1892; died October 10.

*Fish, Lawrence J.,* Minneapolis, Minn.; University of Minnesota School of Dentistry, 1902; died September 19; aged 61.

*Galbreath, Clyde C.,* Woodlawn, Ill.; Chicago College of Dental Surgery, 1918; died October 16.

*Gingras, Ivan C.,* Columbia, Pa.; School of Dentistry University of Pennsylvania, 1909; died September 7.

*Heck, E. G.,* Chicago, Ill.; Northwestern University Dental School, 1904; died October 13.

*Hefferman, James J.,* Philadelphia, Pa.; School of Dentistry University of Pennsylvania, 1891; died August 8.

*Keys, W. J.,* Hutchinson, Kan.; Kansas City-Western Dental College, 1905; died October 15.

*Loppenthein, John W.,* Ludington, Mich.; Chicago College of Dental Surgery, 1898; died October 16; aged 64.

*Martin, James C.,* Rockford, Ill.; Northwestern University Dental School, 1914; died September 24; aged 50.

*McBride, W. H.,* Coffeyville, Kan.; Kansas City Dental College, 1905; died December 1; aged 62.

*Nelson, John W.,* Minneapolis, Minn.; University of Minnesota College of Dentistry, 1918; died September 6; aged 45.

*Pontious, William H.,* Chicago, Ill.; Northwestern University Dental School, 1889; died September 25; aged 78.

*Reeves, George H.,* Los Angeles, Calif.; St. Louis University School of Dentistry, 1908; died September 19; aged 62.

*Rhodes, F. D.* (Major); Moultrie, S. C.; Washington University School of Dentistry, 1908; died October 2.

*Richardson, Elizabeth E.,* San Francisco, California; College of Physicians and Surgeons, School of Dentistry, 1901; died November 30.

*Sparrow, C. C.,* Minneapolis, Minn.; School of Dentistry University of Minnesota, 1903; died November 13; aged 57.

*Taylor, J. Ostram,* New York City; New York College of Dentistry, 1893; died October 18.

# ANNOUNCEMENTS*

## CALENDAR OF MEETINGS

American Dental Association, Atlantic City, N. J., July 12-16.

Academy of Anesthesiology, New York City, January 13.

American Academy of Restorative Dentistry, Atlantic City, N. J., July 10-11.

American Association of Dental Schools, Baltimore, Md., March 15-17.

American Board of Orthodontia, Chicago, Ill., April 17.

American Dental Society of Europe, Paris, France, August 2-5.

American Society of Oral Surgeons and Exodontists, Atlantic City, N. J., July 9-10.

American Society of Orthodontists, Chicago, April 19-22.

Chicago Dental Society, February 15-18.

International Association for Dental Research, Baltimore, Md., March 13-14.

American Society for the Advancement of General Anesthesia in Dentistry, New York City, fourth Monday in March and October.

Eastern Association of Graduates of Angle School of Orthodontia, Cleveland, Ohio, March 15-16.

Educational Commission of Detroit District Dental Society, Detroit, Mich., January 14-15.

Five State Post Graduate Clinic, Washington, D. C., March 7-10.

Southern Society of Orthodontists, Atlanta, January 25-27.

Southwestern Society of Orthodontists, Shreveport, La., January 18-20.

Philadelphia County Dental Society, Philadelphia, February 3-5.

North St. Louis Dentists Meeting, January 27-28.

District of Columbia at George Washington University, Washington, D. C., second and fourth Tuesdays in each month from October to June, inclusive.

American Dental Assistants Association, Atlantic City, N. J., July 12-16.

Kings County Dental Society, Brooklyn, N. Y., February 17-20.

Australian Dental Congress, Sydney, August 16-20.

## STATE SOCIETIES

February

Minnesota, at Minneapolis (23-25)

April

Alabama, at Mobile (12-14)
California, at San Jose (13-14)
Kentucky, at Louisville (5-7)
Louisiana, at New Orleans (8-10)
Michigan, at Detroit (26-28)
Wisconsin, at Milwaukee (19-22)

May

Georgia, at Savannah (17-19)
Illinois, at Springfield (11-13)
Iowa, at Des Moines (4-6)
Missouri-Kansas, at Kansas City, Mo. (16-19)
New York, at New York City (4-7)
North Carolina, at Pinehurst (3-5)
Pennsylvania, at Pittsburgh (4-6)
South Dakota, at Mitchell (10-11)
Tennessee, at Knoxville (10-13)
Virginia, at Virginia Beach (10-12)

June

Maine, at Rangeley (25-26)

## STATE BOARDS OF DENTAL EXAMINERS

North Dakota, at Fargo, January 11-16. W. E. Cole, Bismarck, Secretary.

## KENTUCKY STATE DENTAL ASSOCIATION

The sixty-eighth annual meeting of the Kentucky State Dental Association will be held in conjunction with the alumni celebration of the University of Louisville

*Announcements must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

School of Dentistry in Louisville, April 5-7, at the Brown Hotel and the School of Dentistry.

J. H. FULLENWIDER, *Secretary,*
1101 Heyburn Bldg.,
Louisville.

## LOUISIANA STATE DENTAL SOCIETY

The fifty-seventh annual meeting of the Louisiana State Dental Society will be held at New Orleans, April 8-10 at the Roosevelt Hotel.

JULIAN S. BERNHARD, *Secretary,*
417 Medical Arts Bldg.,
Shreveport.

## MICHIGAN STATE DENTAL SOCIETY

The next annual meeting of the Michigan State Dental Society will be held at the Statler Hotel, Detroit, April 26-28.

WILLIAM R. DAVIS, *Secretary,*
Michigan Dept. of Health,
Lansing.

## MISSOURI-KANSAS DENTAL MEETING

The Missouri-Kansas Dental Meeting will be held in the new municipal auditorium, Kansas City, Mo., May 16-19.

CHARLES DIGGES, *Secretary,*
Columbia, Mo.

FRED A. RICHMOND, *Secretary,*
Federal Reserve Life Ins. Bldg.,
Kansas City, Kan.

## FIVE STATE POST GRADUATE CLINIC

The District of Columbia Dental Society will again act as host to the Five State Post Graduate Clinic, March 7-10 at the Wardman Park Hotel, Washington.

C. B. HALL, *Chairman,*
Publicity Committee,
1835 Eye St., N.W.,
Washington.

## KINGS COUNTY DENTAL SOCIETY

The twenty-fifth anniversary celebration of the Kings County Dental Society will be held at the Towers Hotel, Brooklyn, N. Y., February 17-20.

JOSEPH NEMSER, *Secretary,*
62 Hanson Pl.,
Brooklyn, N. Y.

## THE AMERICAN BOARD OF ORTHODONTIA

A meeting of the American Board of Orthodontia will be held at the Edgewater Beach Hotel, Chicago, Ill., April 17, 1937. Those orthodontists who desire to qualify for certificates from the Board should secure the necessary application blank from the secretary. The application must be returned to the secretary, together with any other required credentials, at least sixty days prior to the date of examination. Applications filed at the time of the board meeting will have preliminary consideration, so that the applicant may be advised of the work required for his subsequent examination. Attention is called to the following resolutions adopted by the board: Any person desiring to make application to the board for a certificate must have been in the exclusive practice of orthodontia for a period of not less than five years or an equivalent to be determined by the board and based upon the following conditions: 1. He must be an instructor in orthodontia in a school satisfactory to the board. 2. He must be an associate in the office of an orthodontist whose standing is satisfactory to the board. 3. It is to be definitely understood that any person at the time of making application for a certificate shall be in the exclusive practice of orthodontia in his own name.

CHARLES R. BAKER, *Secretary,*
636 Church Street,
Evanston, Ill.

## DETROIT DISTRICT DENTAL SOCIETY

The Educational Commission of the Detroit District Dental Society invites the members of the American Dental Association to a two-day meeting presenting postgraduate courses, to be held at the Statler Hotel, Detroit, January 14-15. For further information, address

R. L. GIRARDOT, *Chairman,*
Educational Commission,
562 Fisher Bldg.,
Detroit, Mich.

## ACADEMY OF ANESTHESIOLOGY IN ORAL SURGERY

The Academy of Anesthesiology in Oral

Surgery will meet January 13 at the George Washington Hotel, New York City.

J. M. ESKOW, *Secretary,*
147 Market St.,
Perth Amboy, N. J.

AMERICAN SOCIETY FOR THE ADVANCEMENT OF GENERAL ANESTHESIA IN DENTISTRY

The next meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held in the Tower Room of the Hotel Montclair, New York City, March 22.

HARRY J. FIELD, *Secretary,*
130 Market St.,
Newark, N. J.

EASTERN ASSOCIATION OF GRADUATES OF THE ANGLE SCHOOL OF ORTHODONTIA

The Eastern Association of Angle Graduates will hold the next meeting March 15-16 at Western Reserve University, Cleveland, Ohio.

E. SANTLEY BUTLER, *Secretary,*
55 Locust Ave.,
New Rochelle, N. Y.

INTERNATIONAL COLLEGE OF DENTISTS

The 1937 meeting of the United States Section of the International College of Dentists will be held at the Stevens Hotel, Chicago, February 14, at 3 p.m.

ELMER S. BEST, *Registrar,*
801 Medical Arts Bldg.,
Minneapolis, Minn.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

The thirteenth annual meeting of the American Dental Assistants Association will be held at Atlantic City, N. J., July 12-16. For further information, address

LUCILE S. HODGE, *General Secretary,*
Medical Arts Bldg.,
Knoxville, Tenn.

REPRINTS WANTED BY TORONTO UNIVERSITY

The Dental Library of the University of Toronto is exceedingly anxious to build up their reprint collection and would welcome donations of reprints from American authors. Will those desiring to contribute to this library please address their reprints to the:

Library, Faculty of Dentistry,
230 College Street,
Toronto, Canada.

AUSTRALIAN DENTAL CONGRESS

The Ninth Australian Dental Congress, organized by the Australian Dental Association, is to be held in Sydney August 16 to 20. A comprehensive program is being prepared, including all the leading branches of dentistry. The papers and clinics presented will be of the highest possible standard, and the most able speakers and clinicians will be selected. Great attention is to be paid to the social entertainment of visitors. Members of the profession who have never visited Australia should take this opportunity of doing so and of obtaining some ideas of the conditions of life in these southern climes. Australia is a country of long distances and offers untold attractions to the traveler. Its two main cities, Sydney and Melbourne, are among the largest in the British Empire, and will compare most favorably with any of the chief capitals of Europe and elsewhere.

Sydney, with its wonderful harbor, beautiful beaches, busy thoroughfares, excellent facilities and alluring gaieties, affords every opportunity for spending a perfect holiday. The University of Sydney, where the Congress is to be held, is one of the finest in the southern hemisphere.

Combine profit with pleasure! Come to Australia for the great event and see for yourselves the high standard which dentistry has attained and, at the same time, learn something definite of a Continent which, perhaps up to the present, has been little more than a name to many. You will be made most welcome.

PERCY A. ASH, *Secretary-General.*

# Greetings to All Component Society and A.D.A. Members

The New Jersey State Dental Society gladly welcomes the opportunity of serving as host to the American Dental Association for its Seventy-Ninth Annual Meeting at Atlantic City during the week of July 12.

A most cordial invitation is extended to every member of the national organization to participate in what will undoubtedly be a high water mark in the annals of the American Dental Association.

Atlantic City during July will be at its best and its facilities for successfully staging a national convention are unsurpassed. Its Municipal Auditorium, which is the largest and most completely equipped in the world, is centrally located, directly on the ocean-front within easy walking distance of all hotels. Ample hotel accommodations are assured for all attending the convention at rates guaranteed by the hotels to be charged as stipulated.

The time selected for the meeting should prove ideal to plan a vacation trip to New Jersey's delightful sea-coast, where, besides an unexcelled scientific program, there will be much in the line of entertainment for all dentists, as well as their wives and families.

The entire membership of the New Jersey State Dental Society is anxious to have you come, and it is sincerely hoped that you will plan to be among those present.

J. Robert K. Moodey, *President,*

The New Jersey State Dental Society.

# BARGAINS IN CHARITIES

TO relieve the distressed and to give help to the needy is the duty of all. Practically every one contributes to some form of charity, but there are comparatively few who get the most for their money. There are bargains in charity just as there are bargains in merchandise.

The panhandler on the street to whom you hand a quarter may need the money less than you do, but you have neither the time nor the inclination to investigate.

The country is full of the appeals of fake charities for organizations of various names which are rackets of the worst type. One should know the institution to which he contributes.

Many organizations of the most worthy type are unfortunately loaded down with an immense overhead. Their rent, salaries and other administrative expense uses up a large portion of their receipts so that the recipients get but a comparatively small part of your contribution.

The Dental Relief Fund offers a bargain in charities. Every application for relief is investigated carefully by your local and state society. No relief is granted without their O.K. There is no danger of your being "gypped" as in the case of the panhandler or nonexistent fake charity. Your money helps some one who needs help and needs it badly.

There is no percentage of your contribution that goes to pay expense of administration. It all goes to help worthy, needy dentists. The only expense is that of printing and distributing the seals.

No member of the American Dental Association has had to apply for relief from government sources during this depression. The amount needed has been there in the Fund, waiting for his application and for the approval of his local and state organization.

Give this, our own charity, your support. Nowhere else can you obtain such a bargain for your money as you have here at home. Send your contribution now, lest you forget.

Make your check payable to the "A.D.A. Relief Fund" and mail to the American Dental Association, 212 East Superior St., Chicago, Ill.

THE RELIEF FUND COMMITTEE

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